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Reducing Screw Machine Product Costs By Substituting Brass for Steel

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Savings result from higher operating speeds—Reduction in cost of tool equipment—Limitations imposed by the size of the stock—Salvage values of the materials

IT MAY SEEM paradoxical to suggest using a more expensive material in order to reduce the cost of manufacture, but this is what can often be done in producing many kinds of screw machine work. The substitution of brass for steel, even though brass costs between three and four times as much, may result in a decided saving in cost.

The saving in substituting brass for steel is largely due to the higher speed at which operations can be performed on brass. But there is also a gain in using a cheaper tool equipment, it being unnecessary to use high speed steel tools for machining brass.

To whatever degree there is a saving in time it means that the machine is not tied up on the job for so long a period, so that a given equipment is available for materially increased production. Generally, on screw machine work, when steel is being operated on, the speed depends on that at which the thread can be cut, while on brass the spindle speed of the machine is the only limit.

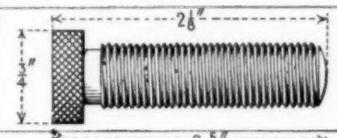
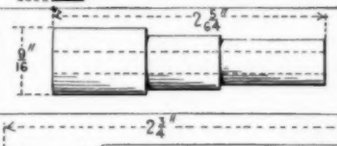
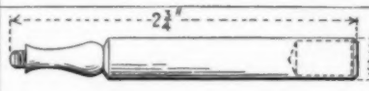
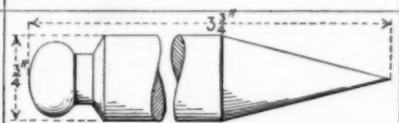
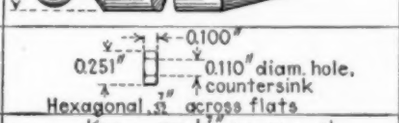
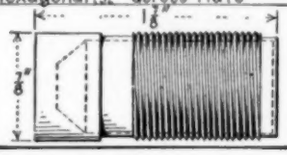
When coarse pitches are cut in steel it is often necessary to use two dies, whereas one is sufficient for brass. Fig. 1 of the table herewith shows an example where these various savings would reduce the time, if the piece is made of brass, to less than one-fifth that which would be required if made of steel.

When made on the Brown & Sharpe regular No. 2 automatic screw machine 115 of these screws can be produced in an hour, on one machine, while if made of steel the estimate is only 27 per hour.

In the accompanying table the comparative costs are given for all the examples figured on the following basis:

Machine time is rated at $1 per hour; man time at $1 per hour, and as one man runs four machines, the man time is 25c. per hour on each machine. Brass rods are figured at 16c. per lb.; steel rods at 5c. per lb. Salvage is estimated at one-third the weight of the stock and at 5c. per lb. more for brass than for steel.

On such a basis, example 1 shows a net cost for brass

Fig.	Samples	Stock	Pieces per Hour	COST EACH				Per Cent	Mach. Prod.
				MACH. TIME	MAN TIME	STOCK	TOTAL		
1		Brass	115	0.0087	0.0022	0.0434	0.0543	100	4.3
		Steel	27	0.0374	0.0078	0.0141	0.0593	109	1
2		Brass	105	0.0095	0.0024	0.0242	0.0361	100	7
		Steel	15	0.0667	0.0167	0.0079	0.0913	250	1
3		Brass	160	0.0063	0.0016	0.0078	0.0157	100	2.2
		Steel	115	0.0087	0.0022	0.0025	0.0209	134	1
			200	0.005	0.0025				
4		Brass	200	0.005	0.0013	0.074	0.0803	100	4.5
		Steel	45	0.0225	0.0056	0.0243	0.0524	65	1
5		Brass	4468	0.00022	0.00005	0.00036	0.00064	100	5.6
		Steel	800	0.00125	0.00031	0.00012	0.00168	263	1
6		Brass	270	0.0037	0.0009	0.0525	0.0571	100	10
		Steel	27	0.037	0.0093	0.0170	0.0633	111	1

COMPARATIVE COSTS AND DATA OF BRASS AND STEEL SCREW MACHINE PRODUCTS

such as to save 9 per cent over what the cost would be if made of steel. This is in addition to the fact that the time a machine would be tied up on the job would as already pointed out be more than five times as long in the making of steel as of brass.

Fig. 2 illustrates another type of job on which an even greater proportional saving can be made in favor of brass. A hole can be drilled in brass about six times as fast as in steel. This together with the saving in other operations, makes it possible to turn out 105 per hour if made of brass where only 15 can be produced in steel. In this case the time as compared with the cost of material is a greater proportion of the total cost and there is thus a relatively greater saving over example 1, so that the cost is considerably less than half as great when using brass as when using steel, and on this job a single machine working on brass may do the work of seven working on steel.

Elimination of Two Handlings

Another feature of saving in brass work is shown in Fig. 3. The piece is finished complete when it leaves the machine if made of brass. This is done by rolling the thread and skiving the back end. Neither thread rolling nor skiving is practicable on such a piece when made of steel, in which case the piece would require two handlings, and a more expensive tool equipment than is necessary when made of brass.

This example brings in an added complication in estimating the production costs, on account of the two handlings required when making the piece of steel. In the second operation, in the case of steel, only two machines instead of four could be operated by the workman, so that double the labor cost must be figured on the operation. The net cost, after taking these matters into consideration, shows that the piece when made of steel would cost 34 per cent more than when made of brass.

Cost of Brass Production with Increased Size of Stock

Fig. 4 shows a plumb bob with an estimate for both brass and steel. In considering the estimate it should be borne in mind that the cost of the forming and cutting-off tools would be appreciably higher for steel than for brass.

This higher tool cost would, when the quantities are not very large, offset the extra cost of producing the piece from brass, which in this case is almost double the cost of steel. Such a piece would not be produced as cheaply in brass, for the reason that the stock constitutes a larger proportion of the total cost than in any other of the cases cited. This, however, is a case where brass, regardless of cost, would preferably be used, because of its greater weight and resistance to corrosion; and the figures show that the difference in cost would not be anywhere near as great as the difference in the price of the materials alone would indicate.

It must also be borne in mind that when producing the piece of brass four and a half times as many are produced per hour, so that there is this economy in machine equipment.

A small hexagonal nut used in large quantities by alarm clock manufacturers is shown in Fig. 5. The production figures show a marked advantage in making the pieces from brass. When made on the No. 19 Brown & Sharpe automatic screw machine, a machine especially adapted to high speed work, 4,468 per hour is the production in brass, as compared with 800 from steel when made on the Brown & Sharpe No. 00 machine. The piece also shows a marked reduction in cost when made in brass, being much less than one-half that of steel. These figures are for the blank without threading.

Fig. 6 shows the greatest extreme in production of any example given, one machine operating on brass doing the work of ten operating on steel. The net cost, however, due to taking into consideration the cost of material, shows but 11 per cent gain over steel. Even if there were no gain in cost, or even a loss, it would be a matter of economy to make such a piece of brass rather than steel because of the very great saving in floor space and of equipment.

Experience shows that a workman as a rule can run about the same number of machines whether on brass or steel and the difference in power required is not enough to be taken into consideration.

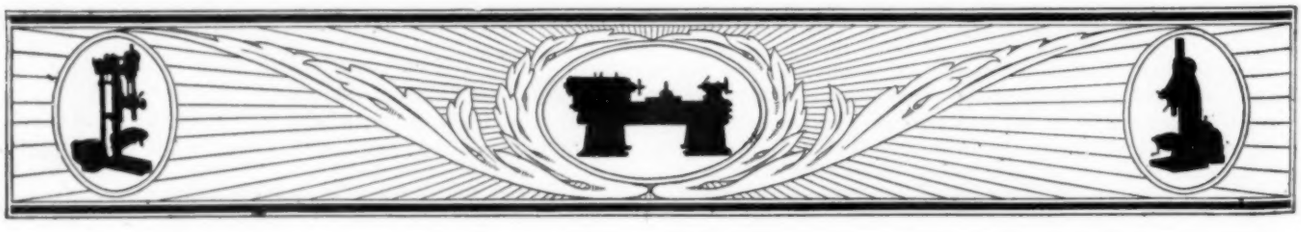
As showing the value of chips salvaged from brass production it is reported that one large screw machine jobbing shop has paid the wages of its men from the price received from its brass chips alone; while the price received for steel chips is very small.

There are many cases where the substitution of brass for steel would be impracticable aside from questions of cost, but there are also many others where the substitution could be made to advantage, even if the cost were the same. The trend of screw machine manufacture at the present time is to equip machines to operate at such speeds as to secure the maximum production from brass, so that it is expected that even higher production figures than those given will be available for work made of that metal. On the other hand until some cutting tools that will stand higher speed for steel are found, the rate of production on steel parts will remain about the same.

Production in Bethlehem District

More than half of the manufactured and mining products of the United States comes from the great eastern industrial district of which Bethlehem is the center, according to a survey made by President Charles Russ Richards of Lehigh University.

Dr. Richards said that in this district, containing the fourteen leading industrial states in the country, manufactured and mining products worth $35,634,716,063 were produced in the last census year. This amount is 54 per cent of the total production for the United States in that year, which was $65,576,542,739. Of this total Pennsylvania alone produced $8,135,153,976, or 12.4 per cent of the total.



Machine Shops on the Pacific Cost

By FRED H. COLVIN
Editor, *American Machinist*

A study of their growth, the selection of their equipment and the type of men employed, with particular reference to California shops

"MACHINE SHOPS all look alike to me," said the sales manager of a big machine building concern. "A lathe is a lathe whether it's in Maine or California, and the work it does do is very much the same everywhere. Orders are orders to me, and the bigger they are the better I like 'em." A trite remark, smartly said and seemed to settle the whole question. But it's a safe bet that the sales manager has never been west of the Mississippi or down in the Gulf States. The sales manager who only thinks of the big orders and does not know that there is a vast difference in machine shops and machine shop requirements needs a lot of education. For the man who thinks that all shops look alike, needs to study conditions at first hand as they are in different sections of the country.

We are all apt to make the mistake of thinking that the big shop is typical of the country, when in reality there are comparatively few shops employing over five hundred men. The average shop of the East is not large and the average Western shop is smaller still. But there's a difference beside that of mere size—it's a different kind of a shop in the majority of cases.

There are many small shops in New England but most of them are manufacturing some special article on a comparatively large scale. They have specialized in certain lines of manufacturing and have developed special machinery as well as people to run them. The "all-round" mechanic is as much out of place in these shops, except perhaps to keep machines in order, as in the large plant.

On the Pacific Coast the case is entirely different. The average shop is small—in fact there are very few large shops and practically none which manufacture on a large scale. But instead of being small manufacturing shops, they are, for the most part, jobbing or contract shops and build or repair anything from a gas engine to a gold dredge. The machine "operator" is almost unknown and the "all-round" mechanic prevails. The owner is usually manager, superintendent, foreman, purchasing agent, production engineer, planning department, sales manager, bookkeeper and shipping clerk all in one. Bill, his best man, doesn't wear any title but he's the whole works when Mr. Owner is out getting orders or collecting money for work done. And Bill's opinion as to what machine to buy or what steel stands up best in a lathe tool, goes a long ways with the boss who benefits by Bill's experience.

MEMORIAL TO THE FOUNDER OF THE UNION IRON WORKS, SAN FRANCISCO, CAL.

We think of the Pacific Coast as a new country and usually forget that California, at least, dates back a long way. What is now the Bethlehem Shipbuilding Co. of San Francisco was founded away back in 1849, before most of our present eastern shops were even thought of. It was started by Peter Donahue and the tribute erected to his memory by his son, occupying a prominent place on the main street of San Francisco, is really typical of the shops of the far West. This memorial, sculptured by Douglas Tilden and erected in 1899, is shown herewith and is a striking tribute to the part played by the mechanic in building California and the West. The inscription reads: "Dedicated to mechanics by James Mervyn Donahue in memory of his father, Peter Donahue." I know of no other locality where the mechanic has been so recognized.

The early demands of California were for machinery to be used in mining. Hydraulic giants for placer mining, crushers, engines, hoists, pumps and the like were in great demand but always in too small quantities for

manufacturing methods. Some of the interesting features of such work were told graphically on page 991, Vol. 41, of the *American Machinist* by the late George W. Dickie. Machine tool equipment was not plentiful in the early days, even in the East, and many machines had to be built by the shops themselves. One large lathe, built in San Francisco in 1865, to swing 30 ft., is still the largest on the Pacific Coast.

These conditions developed a set of men, both as mechanics and as managers, who could and would tackle any kind of a job and get away with it. Generally speaking there are no two jobs alike, even today, in the average shop on the Pacific Coast. One of the best known shops for example, and a large shop in its way, has to have half as many engineers and patternmakers as it has mechanics. What production shop could live with fifteen draftsmen and engineers, fifteen patternmakers and only sixty shop men on the payroll? "Old man overhead" is a very prominent citizen in such a shop—and of necessity. For, in addition to the large percentage of so-called non-productive (more properly "indirect") labor, the class and size of work requires a heavy investment in machines which stand idle most of the time. All these factors make many nice problems in management as well as in shop work. And yet some purchasing agents want to buy all machinery by the pound!

One thing which impresses a man familiar with Eastern shops is the difference in the class of equipment, both as to variety and quality. Being a Massachusetts Yankee I'm not especially proud to admit that the average Pacific Coast shops have better equipment than the Eastern shops, but there seems to be no doubt in the matter when it comes to the small shops. In too many cases we of the East have built good new machines for the other fellow and kept the old ones ourselves.

Men Developed by Conditions

The equipment of the average shop is remarkably good, particularly as to quality. Proprietors have apparently learned that it pays to buy a good machine even if it cannot be kept busy all the time. Shop managers elsewhere might well study their selection of machinery to advantage. Nor is the modern equipment confined to standard machine tools. Electric furnaces for hardening tools are not at all uncommon and pyrometer control is standard practice in many shops. Even in the shops located in the midst of newly developed oil fields, standard makes of high-priced lathes and other machine tools are found in abundance. It is this desire to have the best machinery which has helped to bring the yearly machine-tool sales on the Pacific Coast up to the five million mark. For, while this cannot be absolutely verified the consensus of opinion seems to place it in that neighborhood. And this happens to be not far from a dollar per capita of the population.

The average shop, as I have said, has no special line of work on a production basis. There are, however, some surprises in store for the man who tries to fit everything to a preconceived pattern. In several places there are shops with a production program, mostly in automotive lines. Pistons, piston pins, valves and valve cages, clutch plates and ring gears for starters are some of the parts which are made in such large quantities that, in some cases, car load lots have been shipped to eastern dealers. These shops are splendidly equipped with automatics, semi-automatics, grinding machines and hardening apparatus of the latest types. One concern makes 2,000 pistons a day, another has a capacity of 4,000 piston pins which are guaranteed to a one-way tolerance of two-tenths of a thousandth. These shops are, of course, few in number and are only mentioned to show that some automatic and specialized shop equipment finds its way out here.

The great majority of the shops, however, are jobbing shops of one kind or another. Well equipped and manned with machinists of the old type, they differ in many ways from the average small shop of the East. There the small shops are likely to be old and in the hands of the second generation. Here they are comparatively new (in spite of a few old-timers) and the boss is still Jim or Bill, with all that implies in the way of securing co-operation. There are exceptions to every rule, but in the main one gets this atmosphere in the Pacific Coast shop.

The specialist is almost unknown. The toolmaker as a separate class of mechanic is a scarce article, except in the few production shops referred to. In the automotive repair shop, of course, men develop into expert cylinder grinders but in most cases they are also good at other kinds of work. Cylinder grinding machines, by the way, are very fashionable in automobile repairing on the Pacific Coast. It is not uncommon to see shops with two and even three machines at work on cylinders. One reason is probably that cars are driven more miles per year owing to weather conditions and so require regrinding more often.

There are also several small semi-manufacturing businesses which perhaps seem a bit out of place and yet, in some cases at least, they are making good. The best example seems to be that of shops building motor trucks. There are several such shops on the coast that seem to find a real field of their own. The motors are in nearly all cases shipped from the middle west. The same is true of axles and to a large extent, the transmission units. Some transmission units, however, are made in the shops here. The main reason for the trucks built here seems to be that they cater to local conditions as to body requirements and gear reductions to handle the grades in such places as San Francisco.

Conditions Should Be Studied

Getting back to the sales manager of the machine tool building shop, it behooves him to study the Pacific Coast field and its conditions. The only real way is for him to spend some time here and get his facts and impressions at first hand. He will learn that quantity orders are the exceptions, not the rule. That shops are far apart as to mileage, jumps of 500 or 1,000 miles being common. The average equipment, while good, is small as to the number of machines. He will also learn that though the shop is small, the boss and his men are well posted on machines and know what they want—and why. He must forget quantity sales and think of the total from the field rather than the size of the individual order. The aggregate sales on the coast make up a total that is interesting.

But there is only one way to thoroughly appreciate the conditions and the possibilities—study them first hand, with an open mind. Don't jump at conclusions, don't mind sectional jealousies or over-enthusiastic boosters. Take time to find out exactly how things really are and you will go away with an admiration for the courage shown in buying high class equipment and for the results secured.

Manufacturing the Miehle Printing Press

By HOWARD CAMPBELL
Western Editor, *American Machinist*

Straightening heavy shafts — A power screwdriver — Some interesting broaching jobs—Forming the "shoo-fly" finger—Slotting pins in a lathe—The second and concluding article

A STRAIGHTENING machine, used principally to take the kinks out of bed-motion and other large shafts, is shown in Fig. 14. The large handwheel controls a set of gearing that operates the ram *A*. The piece is placed between the centers of the machine and revolved and chalked on the high spots formed by the bends or "kinks." The anvils *A* and *B*, Fig. 15, are then positioned according to the length of the kink and the amount of eccentricity, and pressure is applied to the ram. If an extra amount of pressure is desired, a set of back gearing can be brought into play by means of the smaller of the two handwheels shown in Fig. 14.

The outfit shown in Fig. 16 is used for drilling and tapping the holes in the way-frame. The frames are of cast iron, varying from 4 to 19 ft. in length and con-

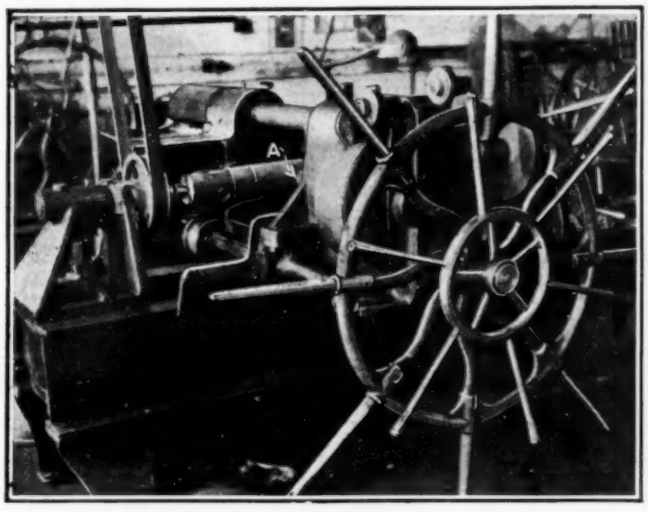


FIG. 14—STRAIGHTENING BED MOTION SHAFTS

taining from 50 to 70 holes, according to the size of the frame. The holes are blind, 1 in. deep, 4½ in. apart, and the tap is ⅜ in. One man can drill and tap all the holes in a medium sized frame in approximately 1½ hr., including setting-up.

A close-up of the machine is shown in Fig. 17. Power is supplied to each machine through a Crocker Wheeler ½-hp. motor which delivers a spindle speed of 1,500 r.p.m. A plate carrying a hardened steel bushing is attached to the machine that does the drilling, and a strop *A* is arranged on the handwheel so that the hole will not be drilled too deep. The second machine follows and taps the hole drilled by the first one. The spindles operate simultaneously.

The operator shown in Fig. 18 is driving ⅜-in. fillister-head screws into the crank of a printing press, using a power screwdriver that travels on an overhead track. The machine consists principally of a spindle with a screwdriver blade in the lower end, and with a rack cut in the side which meshes with the gear on the shaft of the handwheel on which the operator has his

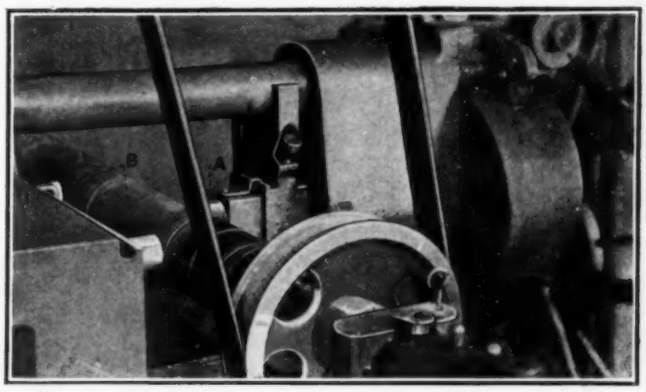


FIG. 15—VIEW SHOWING ANVILS

hand. Power is supplied to the spindle from a Westinghouse 1½-hp. motor, through a pair of bevel gears. A third or reverse bevel gear is controlled by the lever shown just above the operator's head. The machine will drive a given number of screws in one-fourth of the time that would be required in doing it by hand.

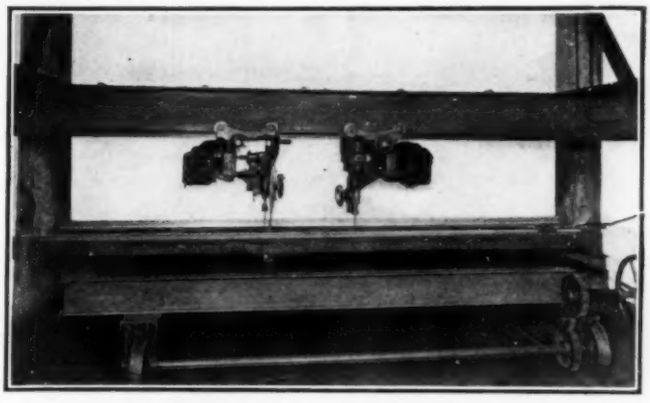


FIG. 16—DRILLING AND TAPPING HOLES IN WAY FRAMES

A simple, but interesting, forming job is shown in Fig. 19. Here a "shoo-fly finger," shown at *A* is being formed from a piece similar to that shown at *B*. A finished piece is shown at *C*. The piece is positioned by a pin at one end, the other end resting on the die. When the ram descends, the roller *D* rolls the piece into

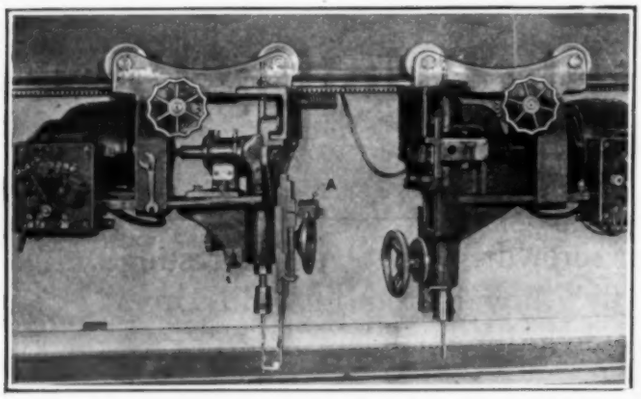


FIG. 17—OPERATING PARTS OF MACHINE

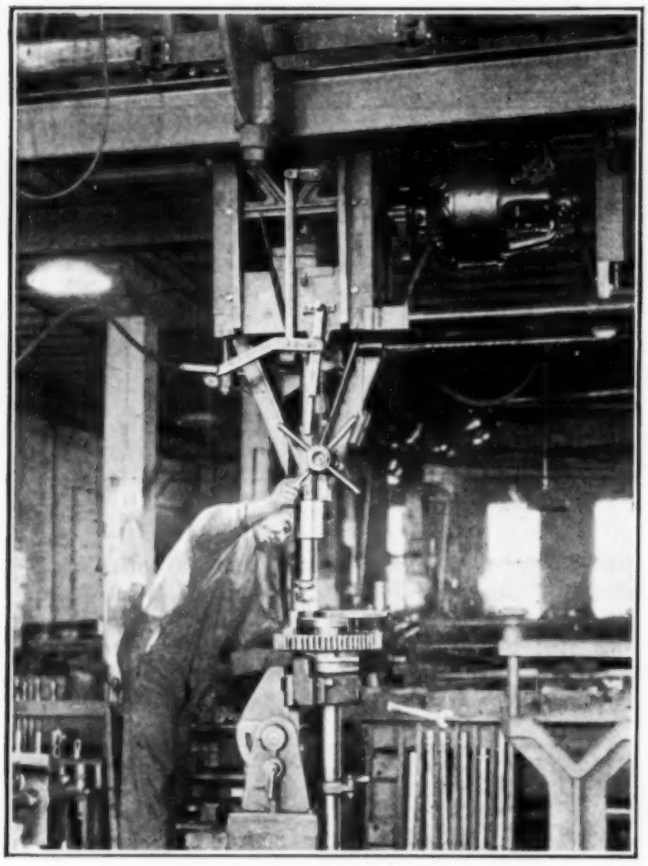


FIG. 18—POWER SCREWDRIVER

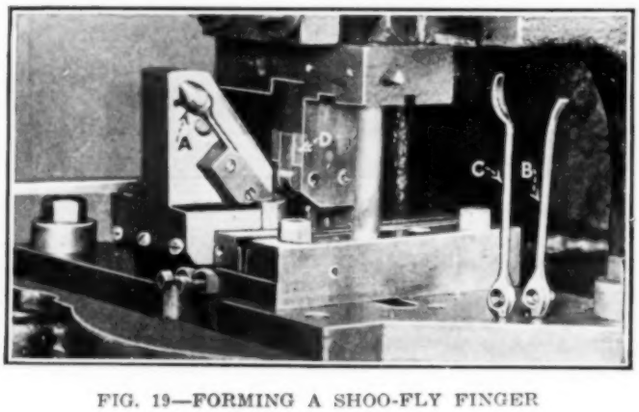


FIG. 19—FORMING A SHOO-FLY FINGER

the shape shown on the upper end of the finished piece *C*. A shoo-fly finger is the piece that lifts the paper off the cylinder so that it can run onto the delivery.

The illustration, Fig. 20, shows the set-up for broaching the irregular opening in the side of the eccentric hook shown lying on the table of the machine. The hook is of cast iron and is 1½ in. thick. The production

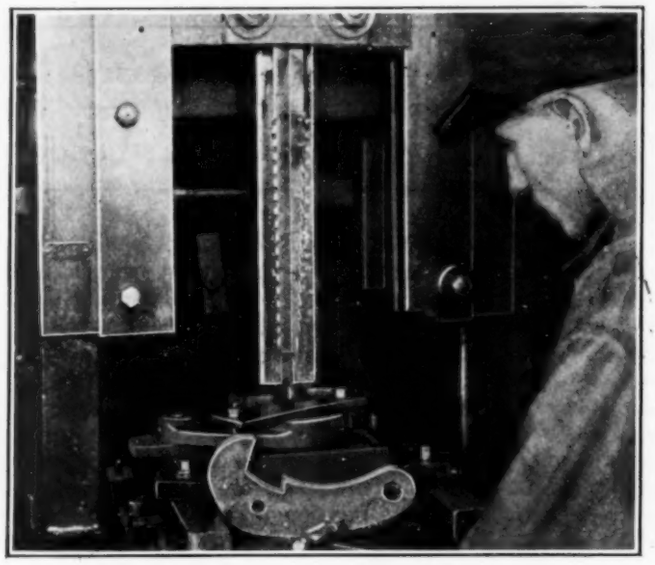


FIG. 20—BROACHING AN ECCENTRIC HOOK

on this job is 30 pieces per hr. The operation of broaching a hole and a flat side at the same time is shown in Fig. 21. The flat broach is about 7 in. long and removes $\frac{1}{8}$ in. of stock. The production is 45 pieces per hr. The machines used in both operations are Bliss presses.

As cams form an important part of the mechanism of a printing press, various methods of producing these

FIG. 21—BROACHING HOLE AND SIDE SIMULTANEOUSLY

parts on a production basis have been tried. The final result is the machine shown in Fig. 22. The cam is shown in process of milling at *A* and the guide plate is indicated at *B*. The carriage is supported by the shaft *E*, Fig. 23, which in turn is supported by the bearings *F*, this construction allowing the carriage to swing back

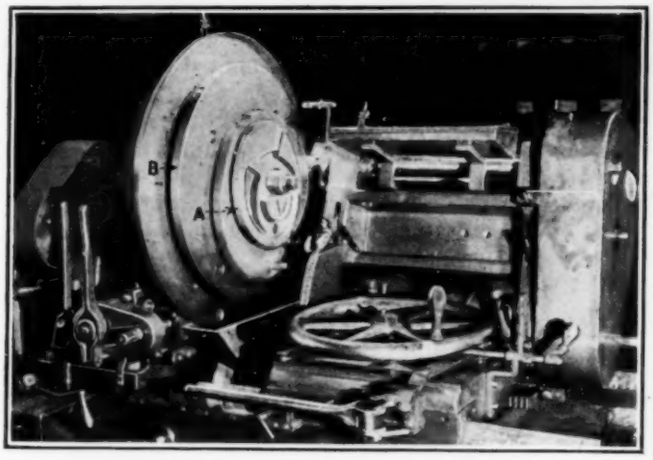


FIG. 22—MILLING PRINTING PRESS CAMS

and forth as the roller follows the guide plate. The cutter and guide roller are held in contact with the work and guide plate by a unique arrangement: the arm *G* supports a weight on the outer end while the inner end, which is very short, carries a gear segment that

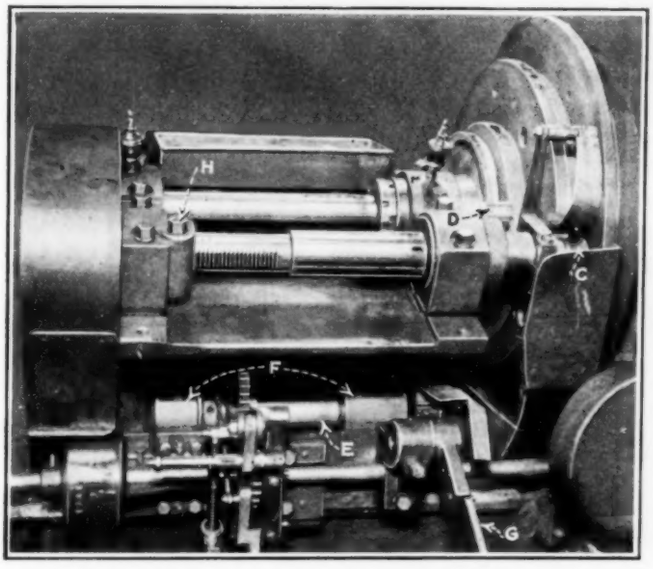


FIG. 23—VIEW SHOWING ROLLER AND CUTTER

meshes with a similar segment on the lower part of the carriage, with the shaft *E* as its axis, as shown. The weight pulls the arm down and forces the gear segment up, turning the other segment as it does so and forcing

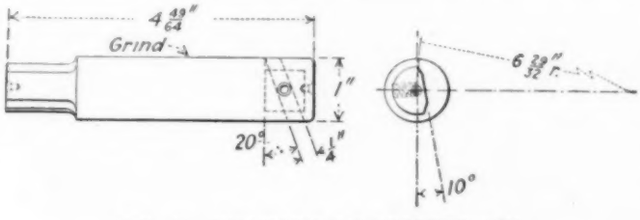


FIG. 24—DRAWING OF GRIPPER PIN

the carriage over as far as the contour of the guide plate, with which the roller is in contact, will allow. The hex shown at *H* is on the end of a pinion that meshes with the rack on the side of the roller spindle sleeve, providing means for adjustment. A similar arrangement is provided for adjusting the cutter. When a new cam is started, the mechanism that controls the spindles is put into operation and the cutter is fed endwise into the work. It is locked in position and the work is started revolving. When the cam has made a complete revolution, the machine stops automatically.

The sketch, Fig. 24, is that of a gripper pin. The groove in the pin is cut by the tool *A* in the machine shown in Fig. 25. This is a lathe, to the spindle of which a drum has been attached, carrying a set of cams and a fixture for holding seven pins, as shown. The weight of the drum and fixture is partially supported by a mandrel and the tailstock center. To the left end

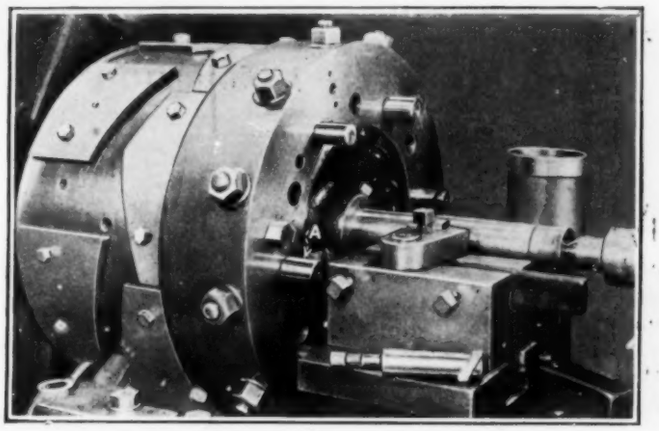


FIG. 25—CUTTING ANGULAR SLOTS IN PINS

of the carriage is attached a cam roller that travels in a groove formed by the cams. The cams are arranged so that as the fixture revolves and a pin is carried past the point of the tool, the carriage is drawn toward the headstock, thus cutting the groove on a 20-deg. angle, and at the same time on a 6 29/32-in. radius, as shown in Fig. 24. Directly after the pin has passed the tool, the cams shunt the carriage toward the tail of the machine so that the tool will be in position for the next pin. The gearing that controls the cross feed has been compounded so that the automatic feed can be used, thus producing an even cut. Fourteen of these pins can be grooved in this machine per hour.

A Problem in Epicyclic Gearing—Discussion

By W. Owen

I was rather surprised to see the old problem of the Humpage gear again raised on page 283 of the *American Machinist* by Mr. De Leeuw. This mechanism has been so fully discussed and calculated at one time or another that it seems to be losing some of its pristine freshness, and one begins to weary of it. However, its value as a mechanical contrivance is by far transcended by its usefulness as an educational problem when properly attacked, a sufficient reason why we must reconcile ourselves to its periodic resurrection.

A further point of interest, at any rate to the writer, is that Mr. De Leeuw mentions that he recollects seeing the problem attacked in the *American Machinist* before. If he will go back as far as 1907, he will find on page 582 in Vol. 30, Part 2, an article on the very gear by the present writer. Although there have been many formulas put forward for the solution of this problem,

after all these years it is still the writer's firm opinion that the method outlined in the article referred to gives the simplest possible solution not only to this, but to any other epicyclic gear.

It is by no means my intention to repeat here the article referred to, but merely to illustrate again the application of the rule therein given to the gear illustrated by Mr. De Leeuw. When worked out by this method, the result shows that 100 revolutions of *E* produce $9\frac{1}{11}$ revolutions of *D*, instead of $\frac{1}{11}$ revolutions as the original article stated.

Apprenticeship, Old-Fashioned and Modern—Discussion

By J. B. Chalmers
Director of Training Schools,
Yale & Towne Manufacturing Co., Stamford, Conn.

MUCH has been written concerning the relative merits of the modern apprentice training courses and the old-fashioned catch-as-much-as-you-can system of raising mechanics. I recall in particular, an article under the above title on page 766, Vol. 57 of the *American Machinist*, by John S. Watts, in which he expresses the opinion that "some of the methods used in training apprentices . . . are not as successful as the older ways were in making mechanics who could think out for themselves the solution of some new problem."

No doubt there are shops which, in spite of the present day enlightenment regarding industrial education, still continue to accept young men as appretices with no thought as to the responsibilities of the company in making good its part of the agreement. In some shops, very few surely, the apprentices may be exploited for the sake of production. In either of these conditions, the inferior methods or lack of methods would justify Mr. Watts' conclusion. These cases are not, however, representative of the modern type of apprentice training systems.

There are three requisites for a school, whether it be a grammar school, a technical school, or an apprentice school. They are: First, a pupil; second, a teacher, and third, subject matter to be taught. In the successful school the teacher must know his trade, which includes not only a thorough knowledge of the subject matter and its derivation, but also the various methods of transmitting this matter to the pupil, selecting after careful study of the pupil the method which promises the best results. In other words, he must be able to "put across" the information so that the pupil can understand it. To accomplish this result, the teacher must get the pupil's point of view. He must be trained in teaching methods applied to his particular work if he is to be a successful teacher.

The pupil of this successful school must have aptitude for the work and seriousness of purpose. Therefore, careful selection of candidates for the work and their close scrutiny throughout a trial period are also important duties of the teacher, as they may save a boy the disappointment of finding himself a misfit in his career as a journeyman. The subject matter must be complete, presented in logical order from a teaching standpoint, and as simple as is consistent with thoroughness.

This is the plan of the modern type of apprentice training which is turning out good mechanics who can think for themselves, and who can also figure for themselves what was formerly too difficult for many of their foremen, and which was either computed in the drafting room or accomplished in the shop by the cut-and-try method. The distinction between teaching and providing an opportunity for the apprentice to learn was not so clearly defined in the old days as it is at present. Apprentices were accepted without examination and were retained just as long as they behaved themselves and continued to do the work assigned. No thought was given to that most important duty of helping the boy find the trade for which he was best fitted.

The old-fashioned notion mentioned in the article quoted, namely that a boy can become a machinist by merely spending four or five years in a machine shop in contact with mechanics and "breathing the atmosphere of a machine shop," is obsolete. Certainly the six months spent in running errands and cleaning up the shop cannot be considered as adding to the apprentice's knowledge of his trade. Cleanliness and neatness are essential and can be taught without such a waste of valuable time.

The apprentice of the modern school is taught the practical work in the shop and also receives instruction in arithmetic, algebra, geometry, trigonometry, mechanical drawing and in some instances, English, industrial geography and economics. These latter subjects, although not essential in producing a good practical mechanic, will broaden his view and make him better able to judge for himself those things concerning his own welfare which are so often judged for mechanics by a salaried and not over-sentimental delegate. He will be happier and therefore a better mechanic.

Advantages of Systematic Instruction

It seems obvious that a person without any knowledge of a machine would learn to operate it with more correctness and in a much shorter time if guided by a competent tutor, than if shown the machine and told to learn to run it. It seems obvious also that the former method would be much better for the machine. The experience gained by the learner without instruction is more than offset by the knowledge of other work performed in the time saved by instruction, even if the machine remained in commission long enough for the untutored one to learn to operate it.

The writer served his apprenticeship in an old-time shop which was large enough to employ several apprentices at the same time, and which offered an excellent opportunity for the apprentice to become familiar with the practical part of the trade. Each boy spent some time in each department, working on lathes, shapers and milling machines, setting-up, and at other available operations. No instruction was given other than that required for the job, except when the apprentice was under a foreman or adjacent to a workman who took a special interest in helping the boys. No one apprentice performed all the types of work; therefore all missed something which had to be learned later when ignorance caused embarassment. In the well planned courses of today all boys receive the same thorough training, some of it concerning work which none of them will meet until after graduation, but which must be included in a course meant to be complete.

Our apprentice courses, like everything else, can be made more effective, but there can be little doubt that the organized training of the present time is far superior to the old way in both thoroughness and scope.

How Management Can Be Made More Productive

By ACHESON SMITH
Vice-President, Acheson Graphite Co., Niagara Falls, N. Y.

What "Greater Production" means and why it is necessary — Influence on prosperity of scarcity of labor — Specific lines of effort that management should follow

ECONOMISTS and clear-thinking publicists have said that greater production is necessary, but by many people such a statement is not understood, and by other people it is not believed. A portion of our population, for instance, is of the opinion that restricted production best serves to increase its wage rates and so is not favorably impressed by statements regarding the value of increasing the output per man. Under these circumstances we should examine the question and see if greater production is better for everyone and what it would accomplish, for unless we see the need for a solution we are unlikely to solve the problem.

When greater production is mentioned many of us are inclined to think that the production at any time is practically equal to the demand, and remember that when it exceeds the demand the producer is injured by falling prices. Those who have been so injured, and many others, therefore fear over-production and believe that a restricted supply will stimulate prices and so give them greater profit. We should realize, however, that such incidents of over-production are only temporary in their efforts and that as a matter of fact the wealth of the country is what we produce in goods and services. If we look at wages in terms of goods rather than in terms of dollars we will see that the total amount of such wages that can be divided among all the people of the country in one year is in round figures what has been produced in that year. If, therefore, we wish to raise our real wages we should increase the total production, for by so doing we would have more goods to divide among ourselves. When we think of ourselves as consumers as well as producers it is evident that if we want more we must produce more. Of course, it is true that there might be an over-supply of some commodities, temporarily, but that condition would quickly correct itself, and those who are not needed in such industries would find lucrative employment in making other things that were in demand. This readjustment has been going on for a century, and undoubtedly will continue, for the total demand is practically unlimited.

We must, however, not only consider total production, but we must approach the problem from the standpoint of per capita production, for that is the only way that we can measure our performance.

Our present high standard of living is due to high per capita production and it in turn is due to the capitalistic organization of society. If we did not have a large amount of capital at our disposal we could not have the elaborate tools of production which in this country have raised our per capita output and given us the highest standard of living in the world.

When the subject of production is discussed many people feel that it is too material and savors of a dollar and cents view of life, whereas they are more interested in life itself and things not industrial nor commercial. It seems only necessary, however, to call their attention to the fact that all our comforts and luxuries have to be produced and that the maintaining of the large class of people who are devoting their time to such work is made possible only by the fact that those who are engaged in producing the necessities of life are able to produce enough to supply the needs of all classes. In the same way we can only maintain a large group of people who are devoting their time to education, music, medicine, etc., if the per capita output of the balance of the population is sufficiently high to produce all of the necessities and comforts that are needed for the entire population. If our per capita production were much lower than it is a great many more people would have to engage in producing the necessities of life and fewer could be spared to make the comforts and luxuries, with the result that we would have fewer luxuries and comforts and our standard of living would be lower. If all the people were working ten hours per day and they decided to adopt the eight-hour day, the average output per person per hour would have to be increased 25 per cent.

> **WHEN EVERY** industrial manager takes an affirmative attitude toward greater output per man, a greater renaissance in the creation of material wealth will begin that will carry our working people to a standard of living and personal development not thought possible today. The capitalistic order of society can be justified and such justification must come very largely by the industrial manager's showing the way to a higher standard of living through greater per capita production.

Address before the National Association of Manufacturers, New York, May 14.

When a group of men makes a demand for higher wages without increasing the output per man, it is simply saying that it wants a larger share of what is produced in the world without helping to increase the production out of which it is to be paid the additional wage. In asking for more it is simply saying that others will have to take less, for that is exactly what would happen. Some of the more progressive labor organizations are studying the subject and are actually co-operating with their employers to increase the per capita production.

Managers desire to pay higher wages but are limited in what they can do if costs tend to rise. The problem is to increase wages and at the same time reduce costs. A substantial increase in the output per employee would make it possible to do both.

The Growing Need for Manual Laborers

The country is growing and our needs increasing. This means that we require more laborers, and in view of the severe restrictions on immigration, it is difficult to see from where they will come. In the highly developed industrial sections of the United States practically no native-born American will do ordinary laboring work, and the children of our foreign-born, if they go through the public schools will not do the work of a common laborer. The tendency to rise socially, and the natural tendency to avoid laborious tasks, makes men shun such work. The result is that in the industrial sections of our country we are not producing laboring men, and as a matter of fact are actually, by our social and educational systems, drawing men rapidly away from that class of work. Our experience for a great many years has shown tbat we are entirely dependent upon alien labor to do most of the manual work, and now that we have either a very small number of laborers entering the country, or are actually losing alien labor, we are facing one of the most serious problems with which manufacturers ever had to deal. As there is serious doubt of the advisability of permitting immigration, and as our social system will rapidly change our present laborers into semi-skilled or white-collar workers, we must realize that the present shortage is not temporary but is a permanent condition which is more likely to become worse than better and so justifies a determined effort to find a remedy.

The present necessity for greater production is the result of the shortage of help, but it should be remembered that we are probably in a long-swing period during which the dollar will increase in value. If, as we believe, the present era of high prices is only temporary, we shall soon be facing declining commodity prices, which will bring on a readjustment period which will necessitate lower costs, both for the purpose of meeting the increased buying power of the dollar, and also for the purpose of meeting the competition of other industrial countries of the world. In other words, increased production is needed now on account of the shortage of men, but later it will be needed to reduce our costs, and thereby help to pull us out of a business depression. In view of this situation we have added incentive.

Turning now to discuss what might be done, it is assumed that plant managers are familiar with what industrial engineering has accomplished, and acquainted with the literature of the subject. Surely, scientific management will never become a reality until it is recognized as a distinct function and so organized and separated from other work that pressure can be kept upon the solution of its problems at all times.

Better arrangement of equipment is frequently very helpful. Studying the relation of machines to each other and considering the supply of material to machines as well as the flow of finished product from them often makes possible a greater output from a department.

A study of the movement of material usually brings to light much that can be done toward eliminating unnecessary moves. A strong effort should be put forth to obviate useless and unnecessary work, and all departments should be carefully scrutinized with that end in view. The Internal Traffic Department is a particularly good field for such work.

Equipment should be given careful study to see if breakdowns can be eliminated and to see if greater speed and better attendance can be made to increase output. Splendid results have been procured in this way.

Balancing departments and balancing equipment are frequent sources of increased output. A perfect balancing makes for greater efficiency both of equipment and men.

The relation of marketable production to total production should be examined with a view to learning if the amount of condemned material is too high, and if so, how it could be reduced. The reduction of non-marketable production is one of the most fruitful fields for work and also one of the most profitable.

Conserving Raw Materials

The conservation of raw materials by avoiding waste and by more intelligent buying, is receiving considerable attention at present. A saving of one per cent sometimes runs into large figures.

Standardization of equipment and product has many advantages and much has been accomplished along this line in a number of industries. It has helped to cut down the amount of labor required per unit of output.

Utilizing a Planning Department

A well functioning Planning Department is essential in good management and well deserves the thought and guidance of those in charge of the company's affairs. Its attention to the routing of orders so that goods flow through departments and arrive on assembly floor or in the shipping department, on time, goes to the very heart of works management.

A suitable and accurate Cost System and dependable Perpetual Inventory records are fundamental to good management, for it is evident that unless such figures are reliable they will not give a true picutre of what is happening throughout the organization. Many times the accuracy of such records is taken for granted, whereas a careful study of them would disclose fundamental defects which should be corrected.

Standardizing the Process

The process should be carefully and minutely standardized so that every employee in the organization knows exactly what his duty is and how it is to be performed. Much can be gained from the study of such standardized procedure.

Wage incentives are well worth looking into carefully, for they have worked wonders in many instances. One of the great advantages that is frequently overlooked in the setting of standards, by which to measure the performance of men is that such standards give us something by which we can measure the performance of foremen, and so sets a measure on management which would not otherwise be had. One of the greatest weak-

nesses in industrial organization has been the absence of a measure of foremen's work. Setting wage standards seems to remedy this fault and should be appreciated by the management at its true worth. Time studies should be made, for without them we have no idea what performance to expect. It would be almost as bad to buy raw materials without analyzing them as to employ labor without making time studies and job analyses.

Intelligent Supervision

Intelligent supervision by foremen is highly important and they should be trained for their work. The effectiveness of foremen lies very largely in the direct supervision of the workmen, and they should have a large portion of their time free for such duties. The amount of clerical work done by foremen should be investigated and if found to be burdensome it should be reduced.

Labor operations, especially those having to do with common labor, should be carefully studied to see if labor-saving devices could be used as a substitute for men. In many manufacturing organizations a scrutiny of the inventory account might reveal materials which are obsolete, or dead stock, which could be converted into cash and the money used in the purchase of labor-saving machinery.

Selecting the Personnel

Men should be carefully selected for jobs and if possible given some training so that they will be happier in their work and therefore less likely to change employment. The labor turn-over is a serious economic loss and justifies every effort to cut it down.

The maintaining of a cordial relation between management and employees is elementary but is frequently not given sufficient attention. Mutual confidence is well worth a determined effort and is the basis of all improvements which have to do with the use of hand labor.

When considering the various things that will make for greater production, managers should not overlook themselves or the personnel of their organizations. Perhaps there is nothing as effective as the expenditure of personal energy on the part of the manager, himself. Another valuable thing is the motivating of responsible subordinates, and great gains can be made by employing means to make and keep such subordinates prime movers, capable of transmitting much of their power to the men under them.

The question of training for executive work deserves attention. Men frequently come into positions as department heads, splendidly informed as to the methods of manufacture used to produce the quantity and guard the quality of the product in question, but absolutely ignorant of the principles of good management. It seems evident that there should be some definite training for executive work which would improve a man's performance in a junior capacity and fit him for a major position.

Studying the Human Element

Those responsible for the success of industrial organizations are beginning to realize that to accomplish much they must commence with personnel training. Not only should human relations in industry receive as much time and thought as the equipment or the process, but every responsible employee should be so trained that he can teach those under him to be helpfully and intelligently co-operative and to know the difference between an efficient and an inefficient way of doing a piece of work.

It is obviously impossible to mention every line of effort that would increase the output per employee. The items touched upon will illustrate where effective work may be done and perhaps act suggestively upon those who are really interested. The field is large and the possible gains very substantial. As one of the leaders in thought on this subject has put it, what we are after is "The maximum utilization of men, methods, machinery, materials and money." This in a few words describes a tremendously big and complicated problem.

When we consider how management may be improved and production increased the first and most important point is the attitude of executives toward the problem. We are very unlikely to improve management unless we recognize it as a science and appreciate the fact that it can be improved from month to month and from year to year and finally put on a much higher level of performance. Industrial engineers have taught us a great deal about the possibilities of management and we should profit by taking the same analytical and constructive attitude toward our very complex problems that they have taken.

Improvements from Small Gains

It should be remembered that in this line of endeavor substantial improvements will probably be made up of a large number of small gains, so that every possible lead should be explored and no small improvement overlooked. Sustained effort is absolutely necessary and the function of industrial management should be so organized that it will be continuously at work and so fanned out that it reaches all departments. The resulting benefits are permanent and accrue as the work progresses.

If statistics on per capita production could be published covering a large number of industries it would be very helpful indeed, as it would indicate whether management is gaining or losing in that respect. As the problem of each industry is to maintain its output with fewer employees than formerly, such statistics would not only indicate the trend but promote a rivalry to increase per capita production which would be very valuable.

Three Classes of Managerial Work

While all managers probably divide their work into the three classes, Planning, Executing and Checking, and attempt to give due attention to each, it is possible that owing to lack of time they find it difficult to give enough attention to the first and third.

Planning and executing are as different in industrial work as strategy and tactics are in military affairs, and it is very evident that the tactics, no matter how well executed, will not be very effective unless the strategy is skillfully planned. In such planning should be included the various elements of industrial management, and they should be given a generous amount of time in order to see that they are properly organized and vigor ously pushed.

Checking consists of:

1. Having proper records.
2. Giving such records adequate study.

Assuming that a plant has proper records, it is obvious that they will not be very helpful unless they are carefully studied and the weaknesses they disclose promptly corrected. We must remember that in large

scale production the management must work through numerous people, and the results be judged largely from statistical records. This simply means that such records must be suitably used or good results will not be procured. A knowledge of accounting and a thorough familiarity with the cost system seem essential to the proper use of plant statistics.

Executing—that is, getting things done—will probably take care of itself, for most managers are very capable in that class of work. If planning can be improved and checking can be done more intelligently, the three phases—planning, executing and checking—will be better balanced, and the management as a whole greatly improved.

When every industrial manager takes an affirmative attitude toward greater output per man, a great renaissance in the creation of material wealth will begin that will carry our working people to a standard of living and personal development not thought possible today. The capitalistic order of society can be justified and such justification must come very largely by the industrial manager showing the way to a higher standard of living through greater per capita production.

Measurement of Short-Time Intervals

Circular No. 470 of the Scientific Papers of the Bureau of Standards describes a method whereby the time between two events which occur less than a second apart can be determined with a high degree of accuracy. The method consists in ruling on the moving film a uniform time scale simultaneously with the recording of events to be studied. The time scale is obtained by throwing flashes of light on the film, the interval between flashes being governed by a special shutter fastened directly to and operated by the prongs of a tuning fork.

The shutter consists of two slotted vanes mounted respectively, on the two prongs of a tuning fork, the slots being parallel to the axis of the fork and so adjusted that when the tuning fork is at rest the vanes overlap and the slots coincide. When the fork vibrates, the slots coincide twice during each vibration and thus form a shutter whose frequency is twice that of the tuning fork. The shutter is brilliantly illuminated and the light which passes through it in flashes is focused on the film by means of a suitable optical system. By using a short-focus cylindrical lens as the last lens of the system, the image of the shutter opening may be distorted into a long, fine line. The photographic film upon development appears ruled into equal time intervals by fine lines, which may extend entirely across it.

Tuning forks varying in frequency from 50 to 500 vibrations per second have been used, the frequency of the fork chosen for the work being governed by the velocity of the film, the length of the interval to be measured, and the accuracy desired. For forks up to 250 cycles per second, a concentrated filament incandescent lamp is a satisfactory source of light, but for the higher-frequency forks it is necessary to use an arc.

For accurate work it is necessary that the timing lines be narrow and their edges sharp. Narrow timing lines can only be obtained if the slots in the shutter are narrow, the magnification of the optical system small, and the velocity of the film no greater than the velocity of the edge of the image of the shutter. The sharpest timing lines are obtained when the velocity of the film is the same as the velocity of the edge of the image of the shutter. As the velocity of the shutter vanes, and hence of the image of the edge of the shutter, depends upon the frequency of the fork as well as upon its amplitude of vibration, narrow and sharp timing lines can only be obtained with high-velocity films by using forks of high frequency and causing them to vibrate with considerable amplitude.

The Master Fork of Lower Frequency

In order to obtain a satisfactory amplitude of vibration with the 500-cycle fork, it was driven by electrical impulses timed by a master fork of lower frequency. A 100-cycle fork was found very satisfactory as the master fork. However, if the frequency ratio of the two is not an exact integer, small but periodic errors are introduced. Also the accuracy of the timing line record is limited by errors inherent in electrically driven forks. Both of these difficulties are eliminated by interrupting the impulses from the master fork during the time that the actual exposure is being made, so that during that interval the timing fork is vibrating freely.

The possible sources of errors other than those inherent in the tuning fork are as follows:

(a) Errors in timing lines.

(b) Errors in reading the film.

(c) Errors in the mechanism used to record the events to be studied.

(d) Errors due to acceleration of the film during exposure and to non-uniform shrinkage of the film during the developing and drying process.

The complete paper may be purchased from the Superintendent of Documents, Washington, D. C.

Are Your Employees Educating Themselves?—Discussion

By A. W. Forbes

On page 732, Vol. 58, of the *American Machinist*, Harry Botsford states why the employer should be interested in having his employees study with the correspondence schools. I do not want to question the value of such study, but yet I always hesitate to recommend these schools.

The things that the schools teach are good, provided they are used to give a better understanding of the work. The real study that counts is the study of the particular problems that come up. School study of any kind furnishes the tools with which to tackle the practical problems, but it may also take up the time which should be spent in tackling these particular problems.

At the present time so much stress is laid on the school study in a thousand different kinds of propaganda, that there seems to be little danger of its being neglected. But after a boy has been through our school system up to the age of perhaps 16, then spent a few years at night school and a few more with correspondence schools, there is a real danger that he will neglect to use it to advantage.

I have known cases where the outside school study seemed to work against the person's understanding the work, and in one case I think it was quite an important contributing cause for a person being dropped. So the problem is not as simple as the advertisements of the correspondence schools would make us think.

The German Locomotive Industry

BY HENRY OBERMEYER AND ARTHUR L. GREENE

The cause of present day activity in the locomotive industry—General progress during past four years—Electrification and other improvements—Pessimistic outlook in foreign markets

IN CONSIDERING any essential industry of a country, its present status is of less importance than is the outlook for the future. The present is only important as long as it gives a true portrait of conditions to come. In the case of the locomotive industry of Germany, both construction and repair work, privately and State owned, one could be easily deceived into imagining that its present activity portended even greater activity in the next few years to come. However, in point of fact it requires but slight observation to see that while the main locomotive and equipment shops of the country are going at full blast at present, pessimism of the future is the by-word among those industrials accustomed to facing realities and not illusive ghosts.

Perhaps the latter statement requires explanation. Our own industrials may be surprised to hear of such great present day activity among railroad equipment and locomotive shops of Germany—activity that represents night and day work to keep up with production and orders such as the illustration in Fig. 1 show to be on hand. The natural question is, what is the cause? More natural still is the query that follows: Why, then, under present circumstances, are railroad executives pessimistic of the future? The answer to both these questions is comparatively simple, but in their explanation they cover a situation that throws a strong light on basic industrial conditions of the Germany of today.

The answer to the first question is given when it is stated that all of the chief railroad and equipment factories of Germany are today busy on foreign orders, the bulk of which have come from Russia, the Balkan States, South America and China. Parts of these orders, it is true, are in the form of reparation payments, especially those coming from the Balkan States. The importance of these outside orders to German locomotive works in maintaining production was aptly expressed by a director of the Linke-Hoffman Werke of Breslau, one of the most important private locomotive plants in Germany, who said:

"Previous to the war, 90 per cent of our entire output in locomotives and railroad equipment was for use on our own railroads; today this figure is reversed. Ninety per cent of all construction goes to foreign countries and but 10 per cent to our own. Fortunately these foreign orders, up to the present, have more than counterbalanced the lack of orders from our own railroads and have kept the industry working at full time throughout in spite of the domestic slump."

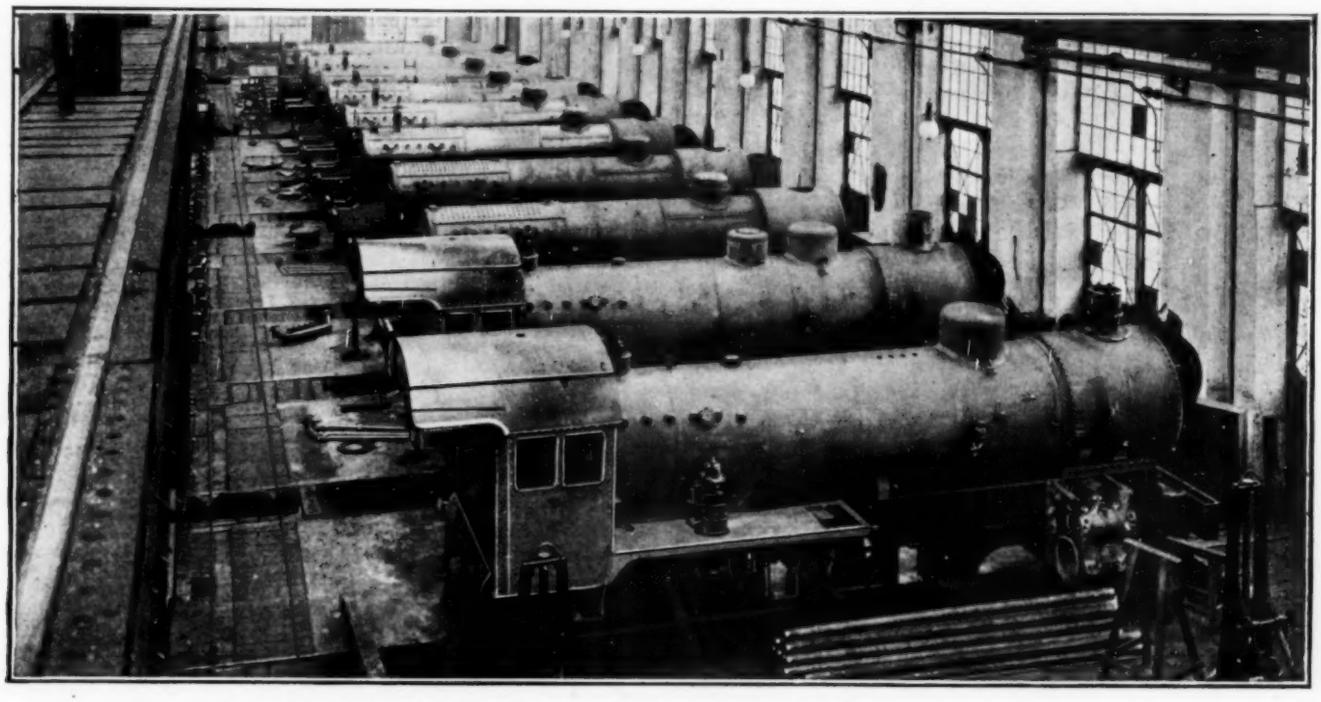


FIG. 1—LOCOMOTIVE ASSEMBLING PLANT AT LINKE-HOFFMAN WERKE

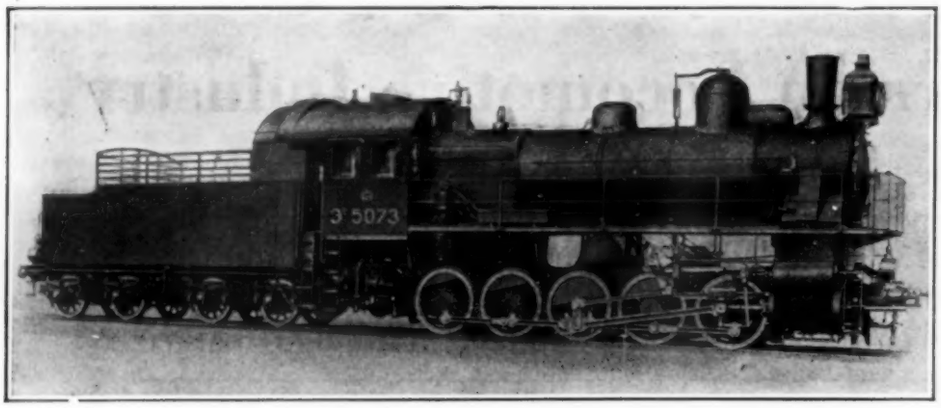


FIG. 2—E ZWILLINGS TYPE OF LOCOMOTIVE FOR RUSSIAN RAILROADS

In these few words is given a true picture of the source of present day activity in the railroad equipment field of Germany. To quote figures it is interesting to note that this company recently received an order from the Russian Government for forty large freight locomotives such as the one shown in Fig. 2 and but more recently still, they received an order from the little Baltic State of Latvia for thirty others. Hopes are held out for a large locomotive order from Poland, in view of the fact that something like 7,000 freight cars have been ordered from the United States for the Polish railroads and for which German manufacturers expect to furnish the necessary locomotives. But, whether or not these hopes will be realized is, of course, a question. German railroad equipment manufacturers are putting forth tremendous efforts to capture the lucrative trade in the South American states, and it is here that direct competition is met with the superior quality equipment put out by our own manufacturers.

Decreased Safety of Rolling Stock

It is no trade secret, and the Germans are among the first to call one's attention to it, that so far as construction of freight and passenger cars is concerned, they are hopelessly outclassed by manufacturers of other countries with respect to quality of wood which they can use in rolling stock construction. The difference between pre-war and post-war construction in this class of railroad equipment is tremendous. Prior to 1914, German locomotive and equipment manufacturers carried the safety factor to the *n*th deg. and had a justly earned reputation of making rolling stock on a scale as good if not better than most of their competitors. The German law required that all railroad equipment, such as freight and passenger cars and essential parts of locomotives, be constructed on a basis capable of standing a strain or pressure seven times that actually laid down by engineers as affording the minimum of safety. The law was carried out to the letter.

Construction of railroad equipment stock in Germany has witnessed a tremendous narrowing of the margin of safety in the case of freight and passenger cars because of a growing scarcity of wood, increased prices for the better qualities and the financial inability of German manufacturers to buy the pitch pine from the United States which formerly constituted the floor and side foundation of all German railroad cars. In Lower Silesia, where the Linke-Hoffman works are situated, the forests have been greatly reduced since 1914, and in but few cases have attempts been made to replace them. The deforestation is true to an even greater extent in the Black Forest where thousands of feet of timber have been sent to France and Belgium in the form of reparations. In other phases of construction, German manufacturers have been and still are handicapped by difficulties in obtaining proper iron and steel for truck and boiler making, and not less important has been the difficulty in obtaining the better grade of coal necessary for foundry burning. But, we will return to this phase of the situation further on.

That the factor of decreased safety in railroad rolling stock is an actuality and not, as might be suspected, a subtle form of propaganda for the lessening of repara-

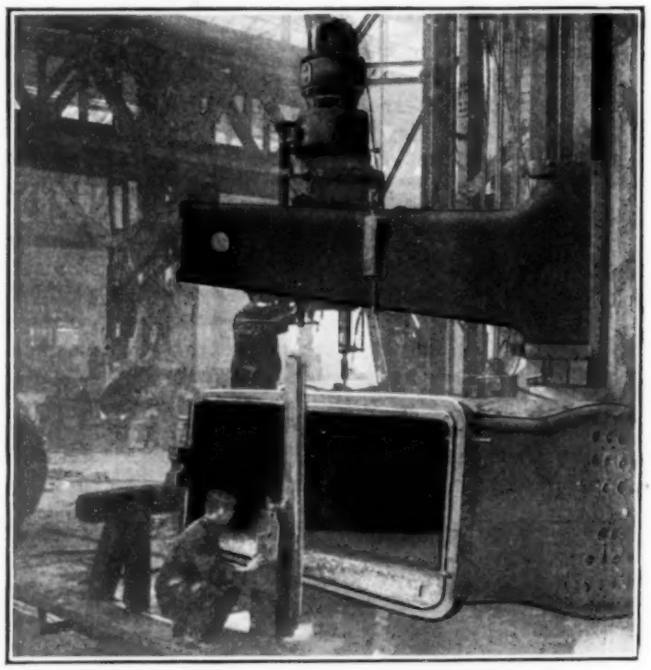


FIG. 3—FIRE BOX OF LOCOMOTIVE UNDER ELECTRIC DRILL

tion payments, can be shown in no better way perhaps than by stating a phase of the situation which came to the fore immediately after the war. As was true in our own country, as well as in Germany, the war brought about tremendous activity in every form of industrial life and not less so in the railroad and equipment field. Perhaps in the case of Germany, the increased activity was even more accentuated than in any other country engaged in the war. Germany early captured large areas of land in Belgium, France and Russia, and in addition, was associated with allies, particularly Turkey, who required immediate assistance in maintaining their rolling stock equipment. These conditions imposed a burden on German locomotive and equipment shops that taxed their production to capacity. Quantity production under stress of war had but one inevitable result. Efficiency and quality were lost in the scramble to increase output, so that, at the end of the war Germany had on her hands thousands of locomotives and a huge quantity of rolling stock that was

of inferior grade. The factor of safety in construction had been so diminished and neglected that people refused to ride in the third-class carriages, while the conditions of the locomotives were hardly in a better state of repair.

The situation has of course been greatly improved upon during the past four years of peace, particularly with regard to the construction of locomotives. As we pointed out in an earlier article, one of the main difficulties confronting German locomotive manufacturers during the war was the shortage of copper for fire boxes such as illustrated in Fig. 3. Today, the shortage does not exist although Germany has to buy practically all copper needed from the United States. With respect to present day construction of freight and passenger cars, the difficulties of securing the proper kinds of wood have not been eliminated to any appreciable extent. In the Linke-Hoffman works a lumber yard occupying many acres of ground is almost completely stripped of reserve supplies, and the area, which before the war contained thousands of feet of all kinds of finished lumber that allowed them to build salon cars containing sixty different kinds of precious wood, is today bare except for one isolated corner where only the basic woods used for foundation purposes are stored.

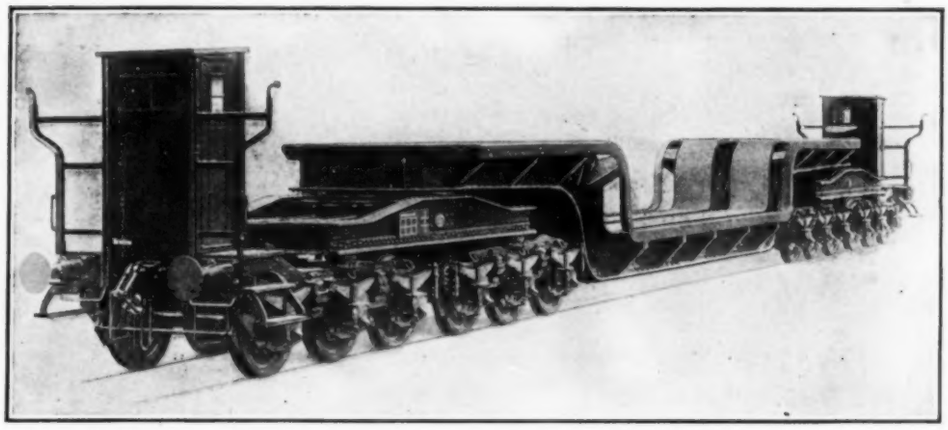


FIG. 4—SPECIAL FREIGHT CAR WITH 12 AXLES AND CARRYING CAPACITY OF 110 TONS

General Progress in Past Four Years

Despite these many handicaps arising from shortage of raw material, the general trend of locomotive and railroad car construction in Germany has made appreciable progress during the past four years, particularly in the conversion of steam locomotives to the electric type, the building of parlor, dining, salon and sleeping cars on the principle of our own Pullmans, in increasing the tonnage and carrying capacity of freight and baggage rolling stock, as shown in Fig. 4, and in effecting consolidations and working agreements with other railroad equipment shops situated in various parts of the country in order to bring about centralization of management and the procuring of raw materials, particularly coal, iron and steel. Undoubtedly, however, the greatest advancement has been made in the development of the electric locomotive, having for its ultimate object the installation of electric trains on all railroad systems in the country.

In German Silesia, the separation effected by the Treaty of Versailles of that section known as Upper Silesia has been of extreme importance and has created drastic changes in the status of the industries in that province. The separation of the upper half of the province from Germany has deprived the country in general, but the industries of Lower Silesia in particular, of their main sources of coal, iron and steel. In consequence, the industries of German Silesia after the war were confronted with two alternatives in securing their supplies of raw material and fuel. One was to bid in competition with their sister industries for the coal and iron of northern and western Germany or to import it from England. The former method was the first tried, but for several reasons was found unwieldy and unsatisfactory. The only course left open, therefore, was to import these products from England, which is being done today on a large scale.

However, the lack of fuel, iron and steel in Lower Silesia has led to a change in industrial management throughout Germany that promises to exert a great influence on future industrial undertakings in the country. In the case of the locomotive and railroad equipment shops, in particular, the past four years have seen rapid strides made in the direction of consolidation of sister industries, the main purpose of which has been to insure each other assistance in maintaining a steady flow of supplies. The Linke-Hoffman Werke, for instance, shortly after the war consolidated with the Waggon Fabric Aktiengesellschaft, Vormals P. H. Herbrand in Cologne, and a short time ago took over the entire management of the plant. In 1920 they also bought up the machine factory of von H. Fullner in Silesia, which owned important coal fields in that section. In 1921 they made a working arrangement with and bought considerable stock in the famous machine and locomotive works of A. C. Lauchhammer. The one avowed purpose of the consolidations

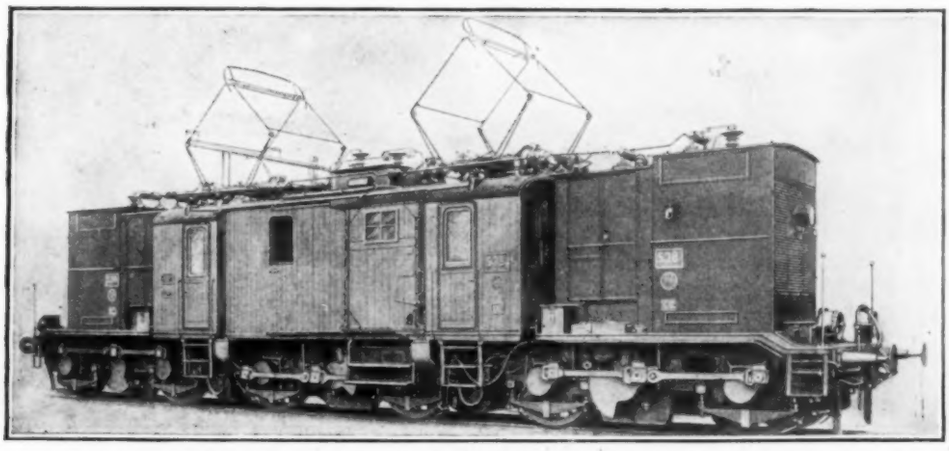


FIG. 5—B + B + B ELECTRIC GUTERZUG LOCOMOTIVE

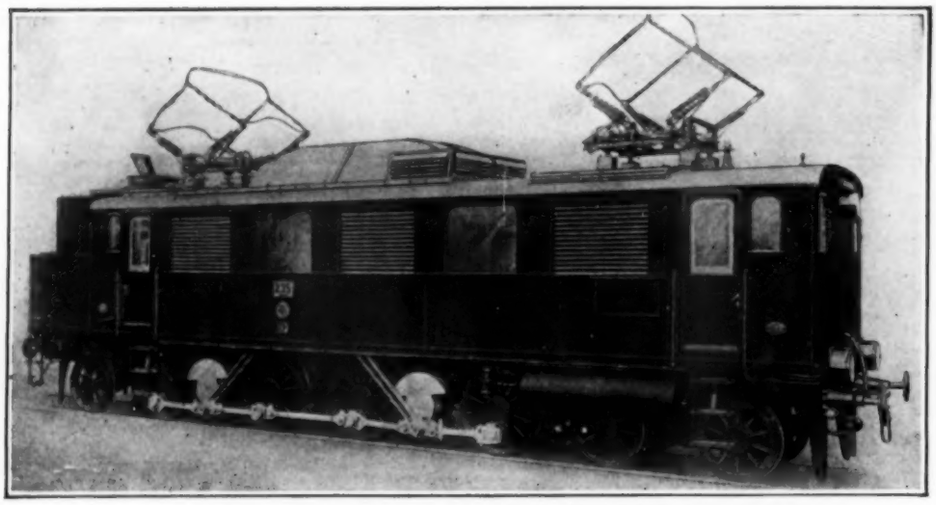


FIG. 6—2 D 1 PASSENGER ELECTRIC LOCOMOTIVE

has been to maintain contact with the sources of iron and steel in various parts of the country, to insure deliveries of coal, and lastly, by turning the branch plants into specialty shops for the manufacture of particular items going into the construction of locomotives and other rolling stock, to save transportation of raw material across the entire length and breadth of Germany. That the policy is in line with the general industrial tendency is shown by the rapidity with which other consolidations and affiliations of a similar nature are taking place throughout the entire State.

But, to return to a consideration of a few of the developments made in the manufacture of electric locomotives within the past few years. The Linke-Hoffman works are one of the leading proponents of the project which aims at electrification of all state owned railroads in Germany. In conformity with that avowed policy, the company was one of the first units in Germany to submit advanced models of electric locomotives to the Prussian State legislature when that body, shortly after the war, called for trials of new types to take place at Lauban. At that time the Linke-Hoffman Co. delivered for trial twelve freight and two fast passenger electric locomotives. The motors installed in these locomotives were made by the famous Siemens-Schuckert Co. of Berlin. The freight locomotives were of the type known as the B + B + B Güterzuglokomotive, illustrated in Fig. 5. The passenger electric locomotives were of the so-called 2D1 type, shown in Fig. 6. These two types of electric locomotives were shortly followed by the introduction of an electric locomotive known as the 2B + B1 passenger locomotive, the motors of which were installed by the Bergmann Co., also of Berlin. The latter attains a speed of 90 miles per hour.

The introduction of these three types of freight and passenger electric locomotives, submitted for test in 1919, have now been followed by others for use on various lines, varying according to the use, the grades and the traction power desired. At the present time the Linke-Hoffman works are manufacturing in addition to the above named locomotives, the following standard electric types, which are generally modifications of the first three types mentioned: 1D1 passenger locomotive; C + C freight locomotive; and the AAA + AAA freight locomotive. The latter type is being manufactured in large numbers at present. The company also manufactures for export trade a great number of small tractor locomotives of the electric type particularly that known as the C+C twin locomotive for a 600 mm. track. This type of locomotive saw its greatest development during the war when the Linke-Hoffman Co. devoted the entire output of one of its plants to the manufacture of railroad tractors for the military staff of the German Army at Warsaw. The fireless locomotive has also been the subject of much experiment during the past two years and its use has spread very generally throughout Germany at present for use in forests and chemical works, while considerable numbers of them have been shipped to Austria, Spain and Russia.

The development of the electric locomotive has been closely followed by improvements in the steam locomotive. The past two years have seen the locomotive shops of Germany building larger and faster steam locomotives for use on fast non-stop trains between points east and west and connecting with transcontinental trains. While the practical utilization of the new types has been retarded because of difficulties in obtaining the proper kinds of fuel, the development of the types has made rapid strides in anticipation of better times ahead. A steam locomotive

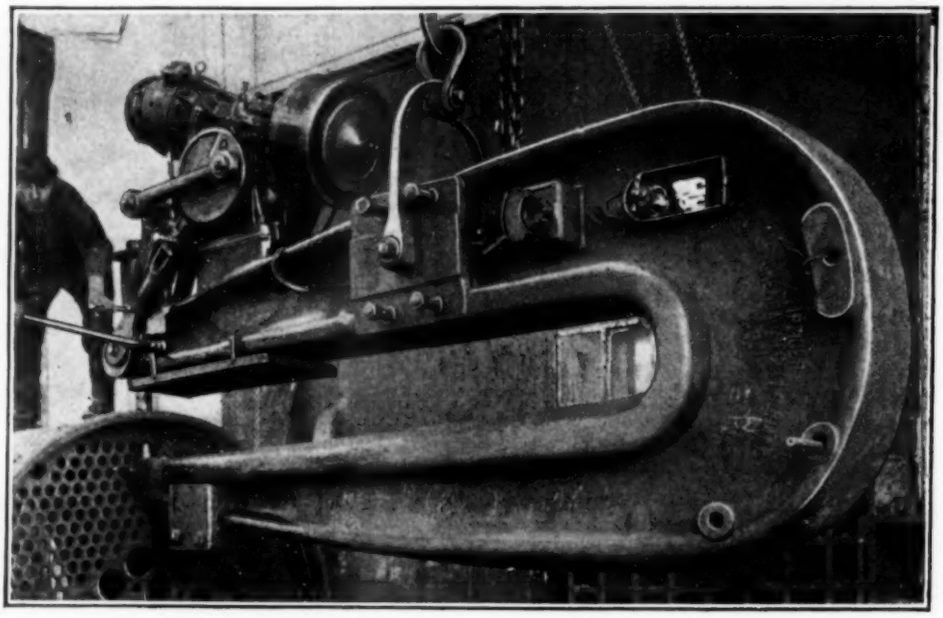


FIG. 7—TRANSPORTABLE ELECTRIC DRILLING MACHINE AT LINKE-HOFFMAN WERKE

has recently been perfected by the Linke-Hoffman Co. capable of maintaining a speed of 123 km. an hour under a dead weight load of 450 tons. This type of locomotive is expected to be put in use on all through trains in Germany.

In addition to maintaining a production of 300 steam locomotives a year, the Linke-Hoffman works have produced more than 116,000 freight and passenger cars of all kinds in the past fifteen years. Included in the number are 216 boiler cars, 2,000 baggage cars, 70 salon cars, many complete medical trains and several hundred special freight cars of twelve axles with a carrying weight of 110 tons. More than 5,000 freight and passenger cars of all kinds have been shipped to foreign countries during the past year. Production has been possible on this large scale chiefly because of the facilities available in the shops due to new types of equipment such as the transportable electric drilling machine in Fig. 7.

While it is true that a great many railroad equipment shops in Germany have been kept employed during the past four years supplying the Allied countries with locomotives and rolling stock as stipulated under the Treaty of Versailles, the past year has witnessed much less employment under this head. At the present time all reparation payments to France and Belgium under this head are said to have been cleared, but there still remains a comparatively small number of cars to be shipped to Serbia and Roumania under the reparations clause. At the Linke-Hoffman works, the writers saw a consignment of 20 baggage and passenger cars being completed for shipment to Serbia. Reparation payments, while certainly not adding to the wealth of the country and its people have, in the case of many German industrials, enabled them to keep all hands employed at full production since the conclusion of peace.

Pessimism Regarding the Future

The brief resumé of past and present conditions brings us back to the second of our questions, namely, "Why, under the circumstances, are railroad executives pessimistic of the future?" There are several fundamental reasons for their pessimistic views, parts of which have been hinted at in what has gone before. Most important, however, are the steadily advancing prices for raw material and construction, for aside from the points always emphasized, of quality before either quantity or price, it is apparent, manufacturers say, that when Germany loses the advantage of lower prices, much of her present foreign business will be transferred to her competitors. That the price factor is already looming threateningly on the horizon of German industrial life, is shown by the recent successful competition of the Baldwin Locomotive Co. of the United States for an order of 20 locomotives for one of the Balkin States, which both Germany and Austria attempted to secure and lost because their prices were on a par with those of our own well-known manufacturer. A point, however, which our informant emphasized as perhaps one of the reasons, beside that of equal prices, why Germany lost the particular order was that Germany was unable to guarantee delivery within the time limit allowed, because of present industrial difficulties in that country due to the French occupation of the Ruhr.

The beginning of the new year, therefore, has found locomotive and equipment manufacturers of Germany facing a new angle of the situation—one incidentally that has all the appearances of being decidedly unfavorable from the viewpoint of underbidding competitors. And with this advantage gone, German manufacturers in the industry are admittedly facing a precarious and decidedly serious situation as regards the possibility of keeping their factories going at full or even part time production.

Competitors in Foreign Markets

What has been forseen by large industrials of Germany for the past twelve months, is today rapidly reaching a head—namely, a situation where with constantly advancing prices for labor, increased overhead costs of production and prices of raw material rising, the German industrial will face in the very near future a situation where he will be unable to compete in foreign markets with such competitors as France, England and the United States. In the railroad equipment field particularly, officials of the Linke-Hoffman Co. estimate that within six months, Germany will be producing rolling stock that will have to be sold at prices on a par with, if not higher than, that of her competitors.

At first glance, the statement might not appear to convey a picture presenting any serious difficulties. Nevertheless, it must be remembered that in the case of Germany, just as price factors in production are advancing with the passage of each month, so in like manner are the difficulties of securing raw materials that must be bought abroad becoming more accentuated. With the mark depreciating to undreamt of levels it is apparent on the face that German locomotive and equipment manufacturers are finding it constantly more difficulty to buy abroad at present rates of exchange. In the case of wood alone, the situation is almost at an impasse at the time of writing, and with the prospect of the occupation of the Ruhr by the French continuing for any great length of time, it is even more apparent that industrial units will be sharply hit by difficulties in securing adequate supplies of fuel. Just how serious is this one difficulty is evident by the fact that at the Linke-Hoffman plants only a sufficient supply of coal can be secured to keep their factory running full time for ten days in case of a shut-down in supply.

In view of the aforementioned difficulties, it becomes apparent that there are only two methods left open to the railroad equipment manufacturers of the country to maintain normal production in the future. The first is to secure long term contracts from foreign countries before prices reach such a level that competition with other countries becomes an impossibility. The second is to appeal to Government help, either by having the Government subsidize the plants or to have it distribute State repair work among private industrials.

Limitations in Foreign Markets

We have already mentioned the steps being taken by railroad equipment shops to secure foreign business. Their one greatest hope in this direction lies in supplying the railroads of the new Baltic States and Russia with locomotives and rolling stock. That they have met with some success in the field is apparent from what has gone before. However, the field is limited very greatly by the fact that the new states of Central and Eastern Europe, with the possible exception of Czecho-Slovakia, are financially embarrassed and the possibility, therefore, of securing immediate orders is one that does not commend itself as one likely to bring about any great results. Certainly, the German manu-

facturers at least are frank to admit that very little tangible hope lies in that direction.

With respect to the second alternative left open to private locomotive and equipment manufacturers in maintaining their force and production, it would appear at the moment that this is the only alternative that offers any security for the future. In view of the fact that private railroad equipment manufacturers in Germany have subsisted, unlike in France, on orders that they were unable to corner for themselves and that no repair work for locomotives or other rolling stock on the State roads was ever given to private industrials, their success in maintaining present-day production is all the more remarkable. The State railroads of Germany have all their own repair shops and for this reason private industrials do not receive help from the State, either directly or indirectly.

However, if present chaotic industrial conditions continue in Germany for the next twelve months and if, as seems more than likely, private German industrials in the locomotive field are unable to secure adequate orders from foreign countries, then may we expect to see inaugurated a new form of State subsidy of private railroad equipment shops to tide them over the economic and financial ills of the next few years. Whether or not such prcedure will become necessary, the next few months can be expected to prove.

What Should Be Expected of the Drawing Room

By J. C. P. Bode

IN THE issue of May 10 of the *American Machinist* and in previous issues there have been discussions about the draftsman and the drawing room and attention has been called to the fact that not everyone in the drawing room is a draftsman. The question then arises, what is to be expected of the well organized drawing room?

To come right down to brass tacks, the modern drawing room should be a great deal more than a mere place to make drawings. It should be the clearing house of information and the service station of the entire organization. The drawing room should co-operate with all the departments and should be the fountain head of information regarding the product, for practically all branches of the organization.

The sales department, the pattern shop, the production office, the shop proper, all should readily and quickly find the information needed by them to make their own department efficient by consulting with the drawing room. Any questions should be quickly, correctly and politely answered. Salesmen should be at liberty to ask for instructions in overcoming difficulties encountered with the machinery in the field. They should be informed without delay when there is a question of capacity or adaptability of the machine to certain work. When special fixtures are needed to make a sale the drawing room should help with quick advice and sketches. Furthermore the drawing room should keep in touch with the sales department to get such ideas as what the customers need and ask for, the data gathered regarding the needs of the trade and flaws that have been called to their attention.

The advertising department should be supported by the drawing room in every conceivable way. When a machine is designed no one ought to know better than the drawing room just what the strong points are and just why certain units or certain details are made as they are. When a designer has a good enough reason to do a thing a certain way, that reason ought to be worth something to the advertising department. It would be no particular hardship to the designer to jot down whatever appeals to him as worth advertising or as worthy of mention and it is just such information that gives the publicity department something to work on.

Assisting the Advertising Department

Features jotted down as they come to mind, without particular order or style mean no extra work to the designer, they may even lead to still better results in his own work as he would naturally wish to design something of the greatest usefulness, but information of such nature is invaluable to the advertising department as well as the sales department. It works out very successfully to have the advertising department write out a list of questions and have the drawing room answer them. It will also avoid a lot of misunderstanding and work to the greatest advantage both ways, to have the designer or another person in the drawing room write out a set of instructions for operating and taking care of the machine. In doing this, frequently weaknesses in design will show up which would otherwise have been overlooked.

It goes without saying that the purchasing department and its branches must have all the data correctly and in plenty of time to have material delivered when needed. Right here much delay can be avoided by consulting the purchasing agent regarding such questions as trade names and methods of ordering parts, so that they can be bought or made up commercially. Often limits are set closer than necessary or specifications are written in a way which would require something special, when a little co-operation with the purchasing agent at the outset would result in getting the material or article the most readily and economically obtainable.

It is no disgrace to admit that the purchasing agent knows better than the draftsman what can be bought to the best advantage and especially when a little difference one way or the other does not effect the design particularly. The purchasing agent may know of something slightly other than what is called for, which would result in a large saving in the long run.

Supplying Correct Cost Information

The cost department will probably and ought to take the initiative in requesting from the drawing room the information necessary to keep costs correctly. Whatever information that may be, should be cheerfully and quickly furnished. It has always been understood that the pattern shop, production office and the shop itself depend on the drawing room for their information and instructions. Service must always be the keynote and the drawing room must go the limit to accommodate these departments for the common good of all.

I take it for granted that all shop departments are being taken care of properly but in taking care of the needs of the first four departments, namely the sales department, the advertising department, the purchasing and the cost department, the drawing room can go a long long way toward increasing the prosperity of the firm. Summing it all up the drawing room should be expected to give courteous service and quick and reliable information to all concerned.

Steel-Car Construction at the Angus Shops of the Canadian Pacific Railway

By H. R. NAYLOR
Assistant Works Manager, Angus Car Shops, C. P. Ry.

Floor area fully served by overhead cranes—Punching machines equipped with automatic spacing devices—Jigs used for assembling—Painting by machine

IN REVIEWING the improvements that have been effected in railway engineering in recent years, reference is usually made to the heavier and more powerful locomotives employed, grade elimination, heavier rails, improved train control and terminal facilities; but while great advances have been made in all these directions, it is a question whether the relative advance in any one of them has equaled that in car construction.

To particularize, a comparison of the modern 60-ton steel-frame box car with the 30-ton wood-frame box car commonly built fifteen years ago brings out two points: the complete change in design, and the effect this change in design must have had on the car shops.

The Angus shops were already well equipped for building passenger and freight cars on an extensive scale, the large passenger and freight shops having supplementary planing mills, gray-iron and wheel foundries, and blacksmith, machine, and truck shops capable of supplying the greater proportion of all the materials required. The output of wood-frame box cars at these shops had reached as high as 40 cars per day. This remarkable organization, however, was rendered obsolete to a large extent when the Canadian Pacific Railway introduced the steel-frame box car to meet the increasing severity of modern traffic requirements, necessitating the erection of an additional shop.

The new shop was located adjoining the wood-freight-car shop, facing a midway upon either side of which were also located the supplementary shops, the midway being served with overhead traveling cranes. It is a steel-frame structure, with steel columns carried on concrete piers, the lower foundation walls being of concrete, 24 in. thick to the ground level and 20 in. thick to a height of 2¾ ft., above which the walls are of red brick and 16 in. thick. The sash frames are of steel, the total sash area being approximately 40 per cent of the total wall space. The roof is carried on steel trusses with ample skylight area. The floors are of 4-in. concrete with a top surface of ⅝-in. mastic.

Shop Divisions Classified

There are three main divisions to the shop. The front one, facing the midway and occupying the entire front, is the machine section, consisting of two 100-ft. bays running parallel to the midway, the one adjoining the midway being 209½ ft. long, while the inner bay is 182 ft. long. Each bay is served by a 10-ton electrically operated crane of the open-latticework type having a span of 96¼ ft. and a height to base of rail of 28½ ft.

The freight-car erecting section is situated in the rear of the machine section, is 72 ft. wide and 405 ft. long, and was originally equipped with one 10-ton traveling crane having a span of 67½ ft., and a height to base of rail of 27 ft. An additional crane of similar capacity has since been installed in this section.

Situated also to the rear of the machine shop is the passenger-car erecting section, consisting of four bays having a total width of 110 ft. These four bays with the 72-ft. freight-car bay complete the full width of the back of the machine shop. Each bay of the passenger-car section is provided with a separate 2-ton traveling crane having a span of 24 ft. 10 in. and a height to base of crane rail of 21 ft.

The Storage Yard

Along the entire front of the shop, between it and the midway, there is ample provision for storing material. This storage yard is 100 ft. wide and is served by a 10-ton crane whose span and height are identical with those in the machine section. This crane runway extends beyond the shop limits and spans several tracks where cars of material can be readily switched and unloaded.

Through the freight-car erecting shop, entering from the rear end, are two standard-gage tracks 18 ft. center to center which extend the full length but do not enter the machine shop. Outside the shop and parallel to the south wall a standard-gage track connects with a track on the midway through turntables. This track is used for delivering the car trucks from the truck shop to the final assembly tracks.

Through each of the passenger-car erecting bays there is a standard-gage track leading in from the rear of the shop, also a transfer table for moving the cars during the various stages of completion. Through the center of the material storage yard there is a standard-gage track connecting by turntables with three tracks running into the machine shop.

The crane facilities are unique in that the whole area of the shop is traversed by electrically operated traveling cranes so arranged that it is possible to install an unusual number, and yet maintain for each crane complete freedom of operation at all times. In this instance the crane arrangement was the deciding factor in the shop layout. It was decided that the machine section of the shop should be independent of the erecting sections in so far as crane service was concerned,

Abstract of a paper presented at the Spring Meeting of the American Society of Mechanical Engineers, Montreal, Canada, May 28 to 31, 1923.

and for this reason the crane runways in this section were installed in a direction transverse to those in the erecting shop. This arrangement made it possible to equip the two machine bays with separate cranes, each having a wide range of action with no interference.

The machine shop is equipped with the following machinery: Four automatic spacing punches, five coping punches, five high-speed punches, two horizontal punches, one 7 ft. 6-in. gate shear; one angle shear, one 36-ft. plate-edge planer, one 30-in. circular saw, one 30-in. metal band saw, one 7-ft. plate roll, one 10-ft. brake, one bulldozer, two special plate-drilling machines, and miscellaneous drill presses, all driven by independent motors.

An unusual plan was followed as regards the installation of machines for heavy punching. The usual practice had been to install a small number of high-capacity machines for the punching and slotting of the sills, side plates, and similar members, necessitating frequent changing of dies and templets, with further limitations in the event of breakdowns. It was therefore decided to overcome these handicaps by installing four automatic spacing punches of moderate capacity to obviate the expense and delay of die changing and double handling, and as the five additional coping punches are duplicates of those used in the automatic spacing tables, replacement can be made with but short delay should they become disabled.

The Machining Operations

The machines are served by narrow-gage service tracks running from the material storage yard, special care being taken to unload the material close to the track by which it will enter the shop.

In all operations the passage through the machines is rapid and the accuracy of the spacing mechanism is such that the punching error is slight and far less than it would be were each hole marked off and punched independently.

The erecting of steel-frame box cars by the jig method was originated at the Angus shops. By this method the underframe, side frames, and end frames are assembled on jigs as complete units ready for the final assembly of the car. The jigs consist of stands or cradles by means of which the various members are accurately placed and held in proper relation to each other until they are riveted together. The advantages of this method are manifold. As each member lies flat in the jig the drawing together of the parts is reduced to a minimum, wedge bolts being used extensively for this purpose as they can be rapidly applied. A complete unit being assembled in one operation, the possibility of a cumulative error is avoided. The jigs dispense entirely with checking for squareness, alignment, and location of connection holes, thereby simplifying the final assembly to a considerable extent.

Before any of the parts are assembled, all concealed surfaces are painted to prevent corrosion.

The center-sill channels after passing through the slot-punching machine are skidded from the idler rollers to trestles just inside the erecting shop, where the draft castings are temporarily bolted on and the holes reamed ready for riveting. An electric hoist operating on a runway below and clear of the overhead cranes, swings the sills into position and the draft castings are riveted on by a compression riveter. The individual sills are then moved across to a position on the left where the two center sills are assembled and riveted with bolster center-castings and separators in position. The sills are placed on stands on which are four fixed pins corresponding to four rivet holes in the sills at the center line of the bolsters. By placing the sills flange down on these pins, perfect alignment of the two sills is assured, which simplifies the application of cover plates later on. The draft gear is also applied in this position.

Assembling Operations

The next step is the assembling of the underframes, and as this is a lengthy operation, four positions are assigned for the purpose. The jigs used in this operation consist of four steel cradles located at bolster and cross-bearer centers, and so arranged that each member of the underframe is held in proper alignment and at centers that will coincide exactly with connections on the side frames. The bottom cover plates of the bolster and cross-bearers are first placed on centering pins; the overhead crane then places the center sills in position, to which are attached the bolster and cross-bearer diaphragms with their cover plates and center-sill cover plate complete, after which the assembly is bolted together and the holes reamed ready for riveting.

The underframes are then swung over by the overhead crane to the riveting jigs on the right, which are constructed similarly to those used for assembling.

The side frames, consisting of the side sill, side-plate, post, braces, door posts, and track, are assembled as a unit on a jig frame situated abreast of the underframe jigs. This jig consists of channel-iron stands, the four corner one of which are capped with short sections of channel iron in which are holes for locating exactly the side sills and plates. The stands on either side are tied together with angle bars carrying additional crossbars upon which the various members of the side frames are placed in proper relation to each other. In this position the side frame is temporarily bolted, then reamed and riveted ready for the final assembly position.

The steel ends and the end sills are assembled on trestles located between the final assembling tracks, and when temporarily bolted together they are skidded to the second and third positions where they are then reamed and riveted. In the fourth position the end ladders, roof-frame brackets, and other parts are applied, the ends as completed being then placed opposite the final assembling position.

The Final Erecting

As the trucks are assembled and painted, they are delivered from the truck shop and enter the erecting shop by the side door immediately ahead of the underframe and side-frame jigs, where they are turned on a turntable and placed in position on the assembling track. The underframe completed in the riveting jig is then lifted by the overhead crane and placed on the trucks, the slings are released, and a steel end is next placed in position and bolted on the end farthest away from the side-frame jigs; the side frames are then placed in position, and finally the second end, along with the center and side-sill cross-ties. The brake-cylinder reservoir and piping are also applied at this time.

The car is then moved by car haul to the second position where the assembled members and the roof framing are riveted in place. In the third position the safety appliances, brake rigging, couplers, uncoupling rods, etc., are applied, the remainder of the riveting completed, and the entire frame is then sprayed with the priming coat of paint ready for finishing.

Before leaving the planing mill the sheathing, roofing, and running boards receive their priming coat of paint in a painting machine recently developed at the Angus shops and which differs from those in use elsewhere. The boards on leaving the matcher pass automatically through the painting machine, where they are sprayed by a series of nozzles which can be set in any desired position according to the surfaces required to be painted. The paint is drawn up through suction pipes from the bottom of the box by means of air jets blowing across the nozzles, and as ejected, it is atomized by the air and blown on to the boards in the form of a fine spray. The amount of paint to be applied is controlled by air valves or by regulating the speed at which the boards pass through the machine. No brushing or wiping is necessary. The boards on leaving the machine are piled on trailer trucks and distributed by tractors to the shops when dry. These machines will paint at the rate of 200 running ft. per min., which is about as fast as the boards can be conveniently piled for drying.

The first operation in the wood freight-car shop is to apply the decking, the joints of which are previously coated with a thick paint compound, as are also the ends of the boards making contact with the bottom boards of the side sheathing previously applied.

The side sheathing which has already received the priming coat of paint is next applied, and to insure that the sides of the car will be watertight, the joints are coated with paint compound, after which they are wedged down into position and bolted to the framing. The end lining is then applied in a similar manner but vertically. In the succeeding operation the roof is applied, the boards and metal sheets of which have previously been primed.

After the doors are hung in place and the remainder of the safety appliances have been installed, the car is given two additional coats of paint and stenciled, when it is complete and ready for service.

Send Complete Specifications with Order

By H. S. Steele

From long experience in the handling of orders for milling cutters, I have observed that many buyers of this class of tools do not give sufficient attention to the numerous specifications involved in their manufacture when ordering special cutters. As an example I will take an order, now lying on my desk, which reads as follows: "One ¾-in. end mill, No. 3 Morse taper shank. Please rush all possible."

This buyer has neglected to mention the hand of the cut and whether carbon or high-speed steel is wanted. His order, therefore, must be held up pending correspondence to determine just what kind of a cutter is wanted, for, if the customer had carbon steel in mind and should receive a bill for high-speed steel, he certainly would not fail to call our attention to the discrepancy.

In the above order there should have been given not only the hand of cut and the material desired, but also whether the cutter was to have straight or spiral teeth, the "hand" of the spiral if the latter was wanted, the length, kind and number of teeth and the type of shank. By type of shank I mean whether it is to be with or without a tang and, if the latter, the size of the hole as well as the form and pitch of the thread for the draw-bolt.

All of these specifications must be known to the manufacturer before he can take even the preliminary steps toward the making of a special cutter, and if any of them are omitted (and many of them usually are) so much time and effort must be wasted in correspondence that the request to "rush all possible" cannot be observed.

In the case of cutters that screw on to the spindle nose, the buyer who is responsible for the order seems to think the manufacturer should be able to guess the right diameter and pitch of thread and whether the cutter is to be used on a 1902 or a 1922 machine. By specifying whether the machine has a threaded nose, tapered nose, or flanged spindle the buyer can advance the time of delivery by at least a week.

Even the cutter salesmen seem to be weak in the matter of getting exact data. Their one ambition seems to be to sell, and let the customer and the manufacturer worry over details. An incomplete order must be made complete before the work can be started in the shop. A few minutes more of the salesman's time when taking the order may save days and even weeks of delay.

When Poor Work Can be Excused—Discussion

By F. P. Terry
Belfast, Ireland

In an article under the above title, published on page 267, Vol. 58 of the *American Machinist*, O. B. Jones raises a point of much interest to machine shop foremen who are concerned in getting out production. Like the superintendent he cites, I much prefer the sincere worker to the one bubbling over with experience.

In most shops there is a good deal of machine work upon which a caliper and rule are all that are necessary and very often the powers that be are seriously perturbed as to how to produce this work economically. It has been my experience that the sincere worker is to be preferred in cases of this sort.

Some time ago we received an order for a number of special machines, and, as it was at a cut price, I was also to cut as much as possible in the machine shop. As an experiment I decided before issuing the drawings to place a red ring around all dimensions that required our usual limits, and a black ring around dimensions that only required caliper and rule measurements. Explanations of these rings were clearly given on the drawings, and I watchfully awaited results.

The sincere and less experienced worker caught on to my idea at once but the man who prided himself on his ability and experience was a different subject. In one case the grinding-machine operator declared that he could stop his machine and size a 2-in. collar on a shaft with a "mike" equally as quick as he could run it down to calipers; "at least," he said to qualify himself, "there was no difference worth talking about."

Of course, many foremen are up against similar problems, and the effect on the worker's morale cannot be overlooked if we are to get the best of work when required. I have no doubt that the sincere and less experienced worker can be made much more accommodating in cases of this sort, and his training, if properly carried out, will help solve a problem that always confronts the foremen: How not to waste time unnecessarily.

Practical Points in Railroad Shop Welding

By E. S. Eldridge
Welding Foreman, D. L. & W. R.R. Shops, Kingsland, N. J.

In making a frame weld with an electric arc, the first step is to strip the frame so as to give the welders plenty of room to work. After this has been done, expand the frame from $\frac{1}{16}$ to $\frac{1}{8}$ in. and then cut or burn out the ends of the opening to about a 60-deg. "V" on both sides of the frame. In case the metal has been burned out, all scales should be carefully chipped off in order to get a good, clean surface to work upon. Sketches *A* and *B* in Fig. 1 illustrate these preparatory stages. After the work has been prepared, the weld is begun at the center, and then continued from edge to edge as shown in sketch *C* of Fig. 1. By performing the work in this way, the same contraction is secured on the last layer as on the first. After the weld has been brought up flush with the sides of the frame, the outer edges are reinformed with $\frac{3}{8}$ or $\frac{3}{4}$ in. round bars of mild steel, 8 in. long and the spaces between the bars are filled in to give the necessary strength. A drawing of such a completed weld is shown in sketch *D* of Fig. 1.

For acetylene welding the engine frame is prepared in the same way as for electric welding except that the expansion is made $\frac{3}{8}$ in., which is a little larger than that required when the electric arc is used. The actual welding is usually performed by two operators, one on each side of the break. The frame is brought up to a yellow heat in the vicinity of the weld before the rod is applied. The weld is begun at the bottom of the "V" where a matted state is first produced. Each succeeding layer of material reinforces the previous layer about 25 per cent. After the weld is made the jacks and wedges are taken out and the metal allowed to cool. When the cooling is completed, it will be found that the frame has come back to the same position it occupied before it was broken. The various stages of gas welding work may be seen in the several sketches of Fig. 2.

Broken cast iron gears can be readily repaired by substituting Tobin bronze for the missing metal parts.

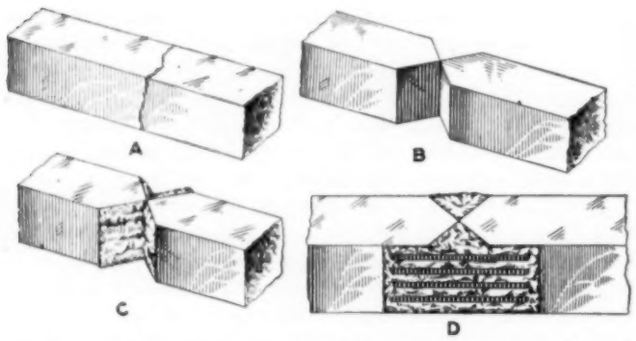


FIG. 1—VARIOUS STEPS IN WELDING A BROKEN FRAME BY THE ELECTRIC ARC

So far it has always been practical to use Tobin bronze in connection with gas welding. In repairing broken teeth the metal is chipped out to a depth of about $\frac{1}{16}$ in. below the root of the tooth. Heat is then applied until the Tobin bronze flows freely. This temperature is slightly below the melting point of the cast iron. The Tobin bronze is spaded over the surface to obtain a tinning effect which is easily secured when the metal is at the right temperature. If the bronze is too hot, it will not take hold or bite into the cast iron and if it is too cold, it will roll off in a ball. When the temperature is correct, however, the Tobin bronze will flow like water. After the gears have been built up in this way, the bronze teeth will stand more strain than the cast iron teeth.

In building up cast iron or brass cams or cam straps to take up side play, the Tobin bronze is put on the same as for gears. By brazing the cams and strap in this way about 15 hours of machine work is saved on each cam and cam strap and at the same time a set is secured which is as good as new. In the brazing of piston heads, it is first necessary to turn them down about $\frac{1}{32}$ in. in order to get below the glazed metal. After this has been done they can be built up to any size desired. In the process of brazing piston heads, the bronze and cast iron are worked together with the result that the mixture of metal will wear longer and will not cut the walls of the cylinder.

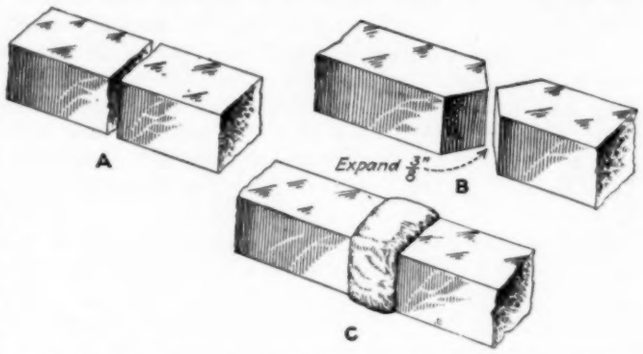


FIG. 2—STAGES IN FRAME WELDING BY GAS TORCH

In welding firebox sheets with the electric arc both the old and the new sheets are clipped to an angle of 45 deg. and the sheet butted together, leaving an opening from $\frac{1}{16}$ to $\frac{1}{8}$ in. The sheets are then tacked together about every 6 in. in order to hold them in place, after which the welding is begun. The first layer is placed in the opening and the remaining of the "V" filled up and reinforced, always using the cross welding. In welding patches in fireboxes, always cut around corners so as to avoid locked up stresses. The patch should also be dished about $\frac{1}{4}$ in. Tack the patch at intervals of 6 in. except at the bottom. The work should alternate, first welding about 6 in. on one end and then 6 in. on the other until the top of the patch is reached. The top seam is then welded, the bottom being left until last. In welding the bottom seam, first tack it as before. By welding the bottom seam last, the heat will travel up through the patch and when contraction takes place the patch will straighten out and the heat of the bottom weld will soften the patch removing all strain.

Another interesting application of electric arc welding is found in the welding of spokes to an engine wheel. In this work the spokes are "V'd" out to about 45 deg. and all scale chipped off one inch back of the weld. The tire is then heated with the tire heater until the broken spokes open up about $\frac{1}{8}$ in., after which the weld is made in the usual manner, reinforced about $\frac{1}{8}$ to $\frac{1}{4}$ in. all the way around the spoke so that when the wheel is cooled off it will come back to where it was in the first place. Trying to weld spokes without heating the wheel will result in a flat spot in the rim and cause a break either in the weld or in the spokes at another place.

Presented before the January, 1923, meeting of the New York Section of the A. W. S.

Shrink Fits at Watertown Arsenal

By F. BRAUER
Chief Draftsman, Watertown Arsenal

Data as to the practice of the Ordnance Department of the U. S. Army in shrink fits for both bronze and steel

THE WORK PERTAINING to ordnance manufacture at the Watertown Arsenal includes comparatively few press fits. When, however, press fits are required the data given in Marks' Handbook and similar publications has been found to be very satisfactory.

The pressing in of trunnion extensions on the naval cradles for use on the 16-in. barbette carriage, model 1919, that is, the load, the diameter, etc., were determined by formulas in the handbooks mentioned.

In the recuperator cylinders for the 16-in. barbette carriage, model 1919, Army Ordnance design, there are inserted water-tight mechanical phosphor-bronze liners 66.84 in. long, the nominal inside diameter being 12.25 in. ± 0.002 in. and the nominal outside diameter 13.27 in. ± 0.001 in. The requirements are that the steel recuperator-cylinder be shrunk over these liners. In Fig. 1 the general drawing shows the liner in position in the recuperator system. The details of the liners are shown in Fig. 2.

The bore of the recuperator cylinder is finished to give a shrinkage of about 0.0015 in. per inch of diameter or about 0.02 in. on the whole diameter, making the bore 13.25 in. ± 0.001 in., this dimension being obtained by reaming processes.

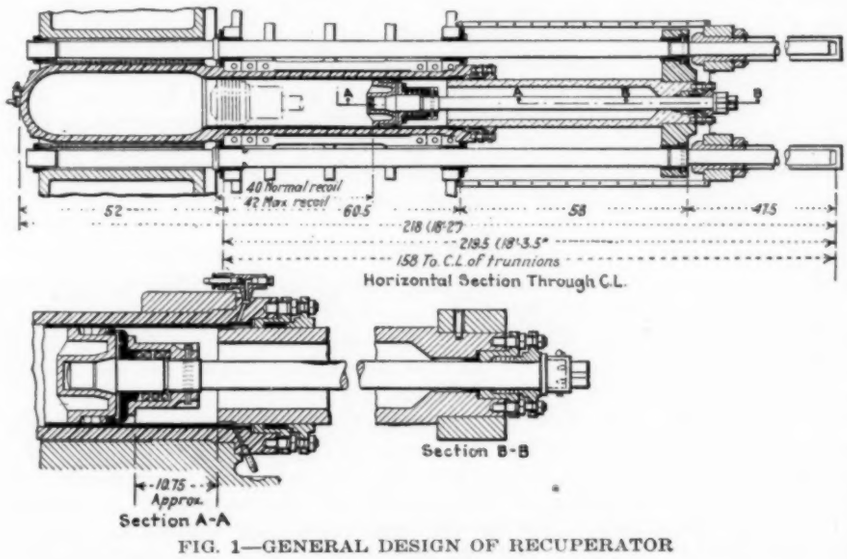


FIG. 1—GENERAL DESIGN OF RECUPERATOR

The outside diameter of the liner, however, is 13.27 in. ± 0.001 in. but the interior diameter of the liner is left 0.125 in. smaller than prescribed to allow for subsequent finish boring and reaming and its front or collar end is left about 0.375 in. longer than shown on the detail drawing.

After machining the cylinder and liner to dimensions stated, the steel cylinder is heated to about 700 deg. F.

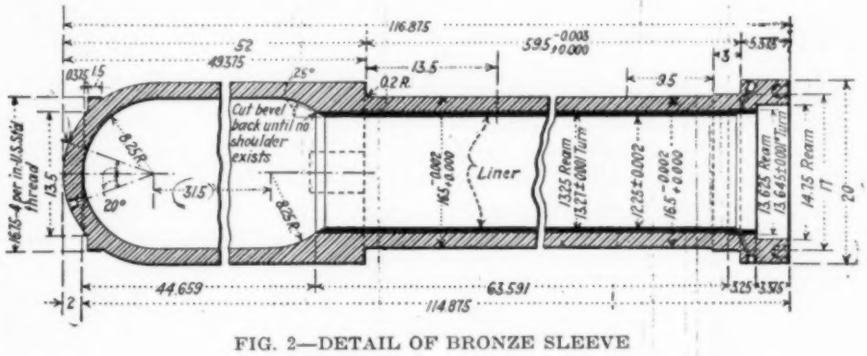


FIG. 2—DETAIL OF BRONZE SLEEVE

and a test gage is run through the bore to insure that proper expansion has taken place. The expansion due to heating to 700 deg. F. is about 0.055 in. which is necessary in a cylinder of this length, although the actual interference would only be 0.02 in. In order to assemble the steel cylinder over the bronze liner and prevent sticking before the liner is home, the fixture shown in Fig. 3 is used, the steel cylinder being suspended with the bottle neck upward in the fixture.

After the liner has been made to its proper size it is set vertically on the leather gasket, shown in Fig. 3. The outside liner is then coated evenly with graphite and engine oil mixed to the consistency of thick paint. Cold water is then run into the inside of the liner continuously through the 1.5-in. inlet pipe shown. The 2-in. overflow pipe which extends from the plug to the top of the liner is to maintain the water at the proper level and thus keep the liner cold. The weight of the liner on the gasket is sufficient to maintain a tight joint at the bottom. The cooling is to prevent the liner from being heated and distorted while the heated steel recuperator cylinder is being put over it.

The split collar *A*, having serrations on the inside and provided with drain holes, is held in place by a retaining ring and swinging bolts. The drain holes permit the escape of cold water sprayed on the cylinder, causing it to seize first at the lower end. The cooling extends upward gradually by conduction only. The spraying is continued until the entire cylinder is cooled. The water pouring out through the drain holes is replaced by water at the top of the retaining ring.

After the cylinder has been shrunk over the liner it is placed with the bulb end down in the fixture for holding it while testing, see Fig. 4. This fixture consists of a base having a leather gasket and retaining ring to suit the diameter of the liner, the plug being held in place by a retaining ring, a split collar and the necessary clamping bolts.

With the cylinder in a vertical position and with the bulb end down, water is pumped into the cylinder through a pipe attached to the upper end of the base

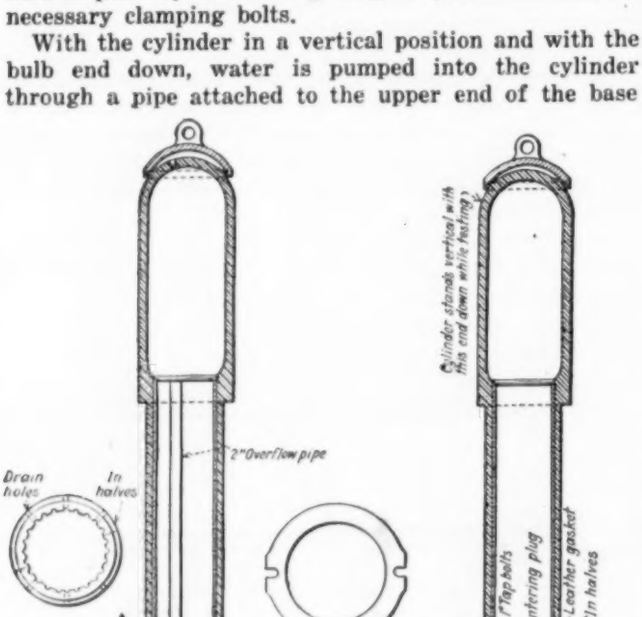


FIG. 3—FIXTURE FOR SHRINKING CYLINDER. FIG. 4—THE TESTING FIXTURE

until the pressure prescribed for the strength-test is attained. If the cylinder passes this test satisfactorily, it is next emptied and subjected to the air leakage test. For this test a small quantity of soap solution is poured into the annular recess formed by the protruding end of the liner, and careful examination is made for leakage between the cylinder and the liner.

After the preliminary tests, which are to insure that the liners are sufficiently tight in the cylinders before further work is done on them, the liner is finish bored and reamed, its protruding end turned off, and finished to final dimensions. When the recuperator is completely assembled it is subject to a hydraulic test for strength and an air pressure for leakage.

This arsenal has very little data available as to the method of shrinkage of parts of built-up guns, but it is believed that a uniform temperature of about 800 deg. F. is used for the pieces to be shrunk together and that the interference is computed to give a certain amount of initial compression to the various members.

Advertising and Courtesy

By M. A. Merrideth

Some time ago my employer decided to buy a lathe and he asked me what make of machine would be best suited for our work. As I had worked with numerous old style lathes I thought it would be of advantage to the company if I wrote to several of the most popular manufacturers, and asked them for information on their modern machines adapted for our work. Now I did not have authority to purchase a lathe, but as I was the mechanic on the job, the owner would accept my decision on what to buy.

The replies to my letters were without a doubt jokes; some firms were not even courteous enough to answer while others wanted to know the name of the firm, that they might send salesmen. I did not want salesmen hanging around the shop pestering me with details and it was for that very reason that I had the letters addressed to my home. Furthermore, since my employer had intrusted me with the work I did not want him to be bothered with the details.

The Results of Correspondence

After about a month of such correspondence, I became disgusted and dropped the matter. When the boss again asked me what decision I had come to, I said that a good second-hand machine was available at an abandoned shipyard. The lathe was bought.

When the purchase had been made a few local salesmen said we should have given the firms they represented a chance since they had just what we were looking for. I then displayed the letters I had received and asked why their firms did not show a little more courtesy in answering letters. They made no reply and I have heard no more from them since. The machine we bought is giving satisfactory service, but the point I wish to bring out is, wouldn't advertising and courtesy go well together?

Another incident which has recently come up explains my point further. We have a double eccentric Corliss engine of a popular manufacturer and it has been causing a little trouble. The nearest history that I could get of this engine was that it was purchased about twenty years ago from some bankrupt firm down south. I wrote to this firm telling them of our trouble and as much of the history of the engine as I knew, and asking if they had a blueprint or some specifications that would help me locate the trouble, so that the engine could be kept in proper condition until our plant was electrified and turbines put in.

Effect of Second Experience

They had courtesy enough to answer but in replying they wanted to know why I had not written on a company letterhead, if we were in the market for a turbine, and what kw. turbine we wished. Now I ask you if that is not enough to make a "Saint swear."

As a result I have turned on this firm and I am now boosting another make of turbine. Furthermore, my boss is falling into my tracks. In this manner I am pointing out the merits of the machinery of certain plants, not giving the previously mentioned firm a chance. Can you blame me? Why don't the manufacturers have advertising and courtesy go together? Perhaps it would effect more sales since the aforementioned experiences must have occurred to many other men in similar positions and with similar results.

Ideas from Practical Men

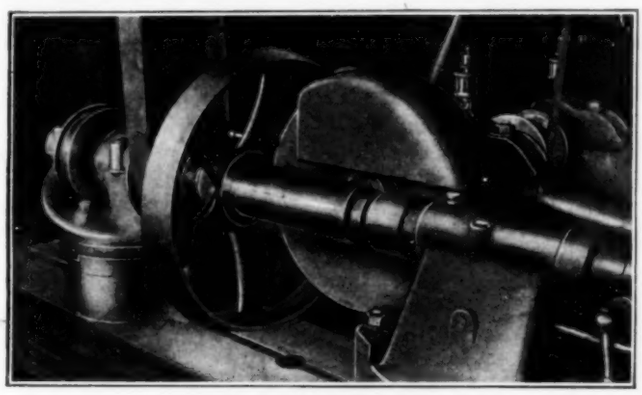
Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Grinding a Clutch Spider

BY MILTON WRIGHT

A rather unusual job of grinding, not altogether easy of accomplishment until you find out how it is done, is shown in the accompanying illustration. The piece is the clutch spider of an overhead countershaft of the kind supplied with the Brown & Sharpe milling machines. The hub is 8 in. long from the ground face of the shoulder, and the latter is 2¼ in. inside the plane of the overhanging periphery, rendering this face and 2½ in. of the hub impossible to reach with a straight wheel.

The casting comes for the grinding operation from the screw machines upon which the preliminary turning and facing is done, the diameter of the hub being left from 0.006 to 0.010 in. oversize for grinding. When the piece is bored, the ends of the bore are chamfered to 60 deg., and these chamfers form the centers upon which the work is held in both of the grinding operations.



A DIFFICULT PIECE TO GRIND

The first grinding is done with a straight wheel, grain 46, grade K crystolon, covering as much of the hub as is possible to reach and reducing it to within 0.002 in. of finished size. For the second operation, which is the difficult one, a cup wheel of grain 50, grade L, crystolon, or grain 3,846, grade K, alundum is used as shown. The machine upon which the work is done is a Brown & Sharpe universal grinding machine with two special features to adapt it to the job; a special wheel-spindle to take the wheel at the end opposite to that upon which it would be mounted on a regular spindle, and a special footstock that is flatted off on the back side to clear the wheel when the wheel head occupies the position shown in the illustration.

Because of the 16 in. diameter of the work, which is larger than the normal capacity of the machine, raising blocks are required under the head and footstocks and also under the wheel head. The wheel head is swung to an angle of about 85 deg. with the line of travel of the table and the wheel is then dressed off with a set diamond so that its face is parallel to and its periphery square with the line of travel.

This second grinding operation is subdivided into two parts. With the work in place on centers the 2½ in. length of hub remaining untouched by the straight wheel is ground to correspond in diameter with the preliminary grinding and the rough face of the shoulder is trued up. After this work has been done upon a dozen or so of the pieces, or when the conditions of the wheel show that it needs redressing, the latter is again trued with the diamond and all of the rough ground pieces gone over again, reducing the full length of the hub to exact diameter and the face of the shoulder to a smooth finish. Work can then be continued on the roughing operation without further attention to the wheel until the next dozen pieces are ready for finishing.

The double operation is performed at a rate of about five pieces an hour.

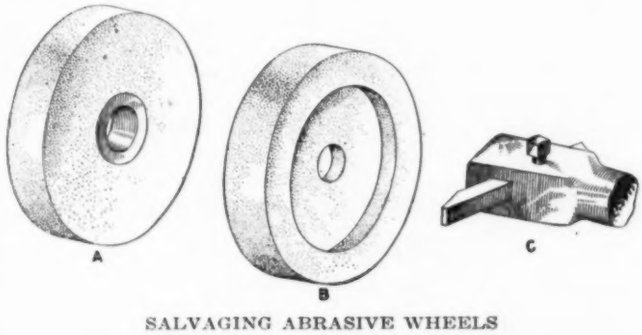
Salvaging Grinding Wheels

BY CLIFFORD H. FRENCH

Among the many toolroom kinks worked out by toolmaker James E. Govett of the Great Northern shops at Hillyard, Wash., is a method of salvaging abrasive wheels for toolroom use. Wheels from grinding stands or from snagging grinders, worn down to from 6 to 8 in. in diameter are brought into the toolroom to be worked over as time permits.

The worn wheel *A* is chucked in a lathe true with the outside, and the face turned or bored out to make a cup wheel as at *B*. A standard tool holder with a small bit is used as at *C*, and is fed across the face by the cross-slide.

A cut about ⅛ in. deep is taken and it only takes a few minutes to bore out the wheel to the required depth. The tool will stand from three to four cuts without re-sharpening. The great secret is to run the wheel on the slowest speed of the lathe so the particles of abrasive are torn out of the bond instead of cutting the steel.



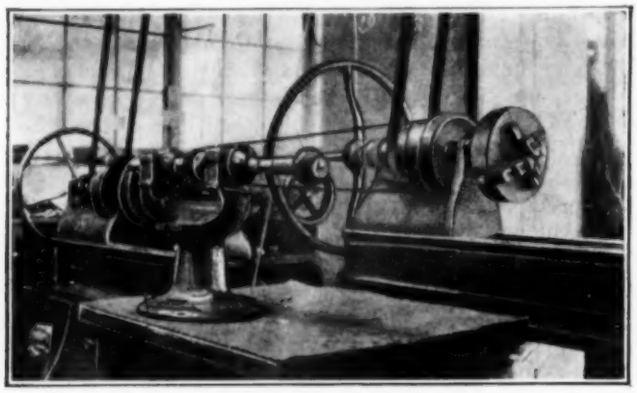
SALVAGING ABRASIVE WHEELS

The hole is filled with lead and rebored to the proper size for the spindle of the tool-grinding machine, after which the salvaged wheel is trued with a diamond in the usual manner and put either into service or into stock for future use.

Brake Wheel on a Speed Lathe

By Frank C. Hudson

The illustration shows the use of a large hand wheel on the back end of a speed lathe spindle, in order to enable the operator to stop it quickly in changing from one piece to another. The brake generally used on this lathe, or on a Fox lathe, consists of a piece of belt fastened at the back of the lathe which can be forced in contact with a considerable portion of one of the steps on the cone pulley, with the left hand. In the case in



BRAKE WHEEL AND COIL WINDER

point, the large wheel, which has a very smooth rim, is used instead of the belt, the friction being supplied by the left hand of the operator.

In this same view is an ingenious device used in the same shop, that of the Kilbourne & Clark Co., Seattle, Wash., manufacturers of radio apparatus. It became necessary to wind a small ball-shaped rotor with a right-hand coil on one side and a left-hand coil on the other. This was accomplished in a sensible manner by installing a small grinding head, or stand, on a bench in front of the lathe, as shown, and driving it with a belt from the cone pulley of the lathe.

With this stand conveniently located, it was an easy matter for the operator to place the bakelite core of the rotor on the right-hand end of the spindle and to wind the first half of the ball with a right-hand coil. It was then only necessary to remove the core and place it on the other end of the spindle with the side to be wound facing out. Again driving the auxiliary head from the speed lathe cone, it was an easy matter to wind a left-hand coil on the opposite half of the ball, and the job was completed. These are only two of many devices used by this concern in securing economical production.

Valve Grinding—Continuous or Reciprocating—Discussion

By Samuel Gibson

Referring to the articles on continuous or reciprocating valve grinding, I do not think the real issue is stated. The process of valve grinding is simple and presents little difficulty to the real mechanic.

In grinding in a valve, a cutting abrasive is put on the valve face, the valve is carefully put in place and turned through a small angle, say about 50 to 60 deg., lifted clear of its seat, returned almost to, or else somewhat past the starting point, put to its seat again and the process repeated until the starting point is reached again in either direction. The valve and seat are then examined for bearing.

Why do we turn the valve and then lift it clear of the face? Not to reciprocate it but so that fresh abrasive could enter between the faces to replace that worn or rubbed away in turning. The results are much the same whether we turn continuously or reciprocate. It is the lifting that does it. In fact if the abrasive is too sticky or too dry to run freely it is necessary to lift out the valve with greater frequency and to rub the abrasive evenly over the face.

It must be remembered that grinding is not intended to cure oval valve seats, oval valves, or bent stems. Grinding in is to render a perfect fit to a true valve seat and to a truly circular valve, whose axes are identical when mounted.

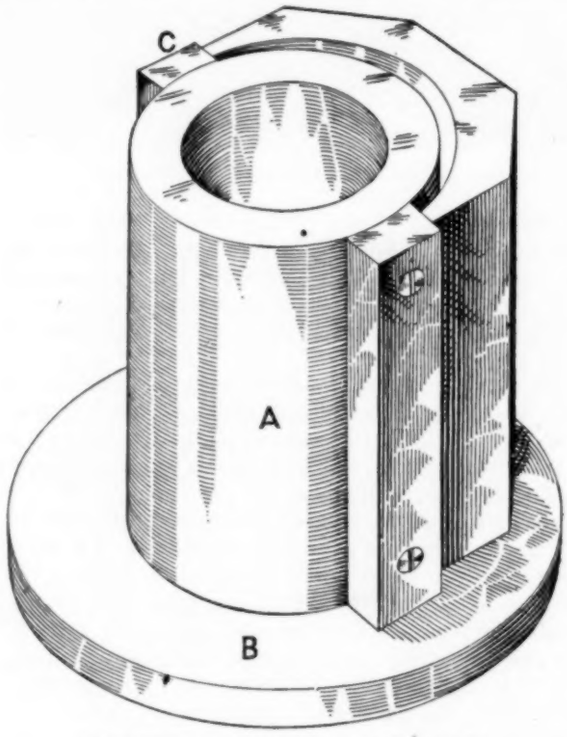
A Simple Babbitting Fixture

By H. F. Crawford

A simple babbitting fixture for truck and car brasses is shown herewith. It is used by the Arizona & Eastern Railroad Co. in its shop at Phoenix, Ariz. It consists of a central core *A* with a flange or base *B*, the core being of the diameter wanted for the inside of the bearing when poured.

The two strips *C* are fastened to the side of the core at the proper place to make abutments for the brasses when they are clamped in position and to keep the insides of the brasses away from the core so as to leave space for the thickness of babbitt wanted.

The edges of the brasses are clamped against the



BABBITTING JIG FOR CAR BRASSES

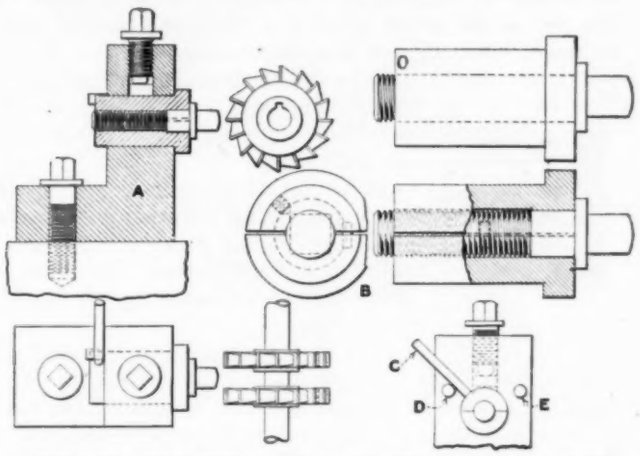
strips, usually in pairs, but one single brass can be poured as shown. This device is a simple one to make and allows the brasses to be handled quickly.

This company babbitts car brasses as well as truck brasses and feels that it is economy to do so as their length of service is increased thereby.

Fixture for Squaring Bolt Heads

By H. C. Crawford

The illustration shows a useful fixture for squaring the heads of a lot of special bolts and is used in the shop of the Armstrong Manufacturing Co., Portland, Oregon. The angle block *A* fastens to the cross-slide of an engine lathe and carries a holder for the bolts,



FIXTURE FOR SQUARING BOLT HEADS IN A LATHE

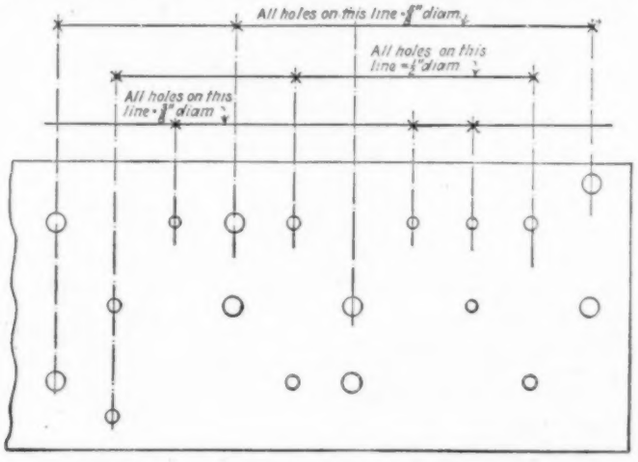
the holder being in halves to make it easy to load and unload. The holder, shown at *B*, is threaded for the bolt and also recessed to allow the collar below the head to bottom against it. There is also a dowel on one side for holding the halves together.

The halves, with the bolt in place, are slipped into the block *A* and clamped by the screw shown at the top. One of the halves of the holder has a handle *C*, by which the bolt in its holder is turned for milling the second cut. Pins *D* and *E* on the back of the block, make it easy to turn the holder just 90 deg. for indexing. The bolt heads are very quickly squared by a pair of good-sized straddle mills driven by the lathe spindle.

Marking Hole Diameters

By Henry C. Francis

While in Denver, Colo., recently I ran across an unusual method of marking dimensions on blueprints. These prints were supplied by a street railway company that was having some special cars built, involving



A METHOD OF DIMENSIONING HOLES BY GROUPS

the use of long channels in which numerous holes were to be punched or drilled. In order to avoid dimensioning each hole in the usual manner, the method shown in the accompanying illustration was used and seemed to be readily understood by the men in the plant.

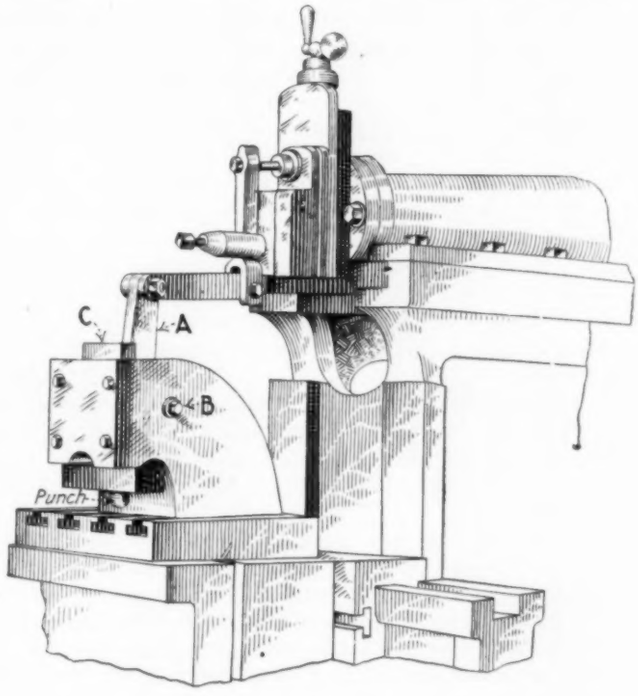
As will be seen, the holes were divided into groups, dimension lines running to each group from a horizontal line at the top. All holes indicated by the upper line were to be drilled ⅝ in., the middle line ½ in., and the lower line ⅜ in., as indicated. There are, of course, many places where this arrangement would probably not be satisfactory, although it is quite probable that some modification of it could be devised if it was found sufficiently valuable.

Making Small Punchings in a Shaper

By Chester H. Franklin

The various departments of the Southern Branch of the University of California at Los Angeles need small punchings of various kinds and for different purposes. Some are for the kindergarten work in the training school, others for the commercial department. In all cases, such work comes to the shop for production and as there is no punch press in the shop equipment, the attachment shown in the accompanying sketch was designed by Instructor Phillips to be used in connection with the shaper. All the work in connection with making the attachment was done in the university shop.

The travel of the shaper ram transmits motion to the vertical ram of the punch press, by means of the link-



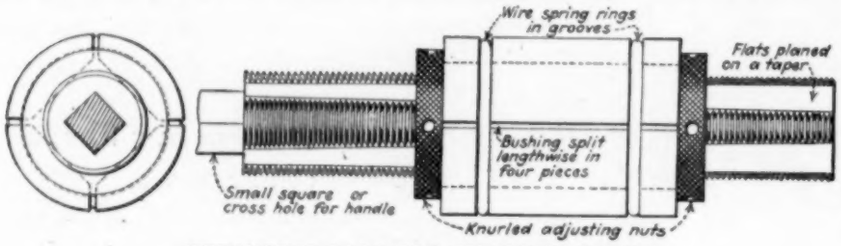
PRESS MOUNTED ON SHAPER

ages shown. One piece goes in the tool post while the horizontal link operates the bell crank *A* which is fulcrumed on the pin *B*. The bell crank actuates the slide or ram *C* which carries the punch. The stroke is controlled by adjusting the ram of the shaper. This device has worked out very nicely for a variety of small punchings.

Expanding Laps for Automobile Engine Cylinders

By Hiram Hicks

The one-part expanding cylinder lap shown by George A. Luers on page 121, Vol. 58, of the *American Machinist* is doubtless more convenient to handle than would be a similar lap made by sawing the piston clear apart, but for producing a round true hole neither can be depended upon, nor should either be used by ambitious garage men who take pride in their work and are actuated by a sincere desire to satisfy their customers rather than to get rid of them quickly.


Wire spring rings in grooves
Flats planed on a taper
Bushing split lengthwise in four pieces
Small square or cross hole for handle
Knurled adjusting nuts

EXPANDING LAPS FOR CYLINDER BORES

The cylinders of any automotive engine that has seen an appreciable amount of service are neither round nor parallel, and lapping them with any kind of two-part lap is more likely to make them worse than better. The reason for this is that such a lap has only a two-point bearing at best and the width of the bearing places diminishes very rapidly as the difference between the diameters of cylinder and lap increases. Thus, when such a lap is revolved in a cylinder that is in any degree oval (as all worn cylinders are) it is constantly opening and closing as the bearing places pass the longer and shorter diameters respectively.

Further, worn cylinders are, more often than not, larger at one end than at the other, and they *may* be larger at both ends than in the middle. As the two-piece lap is worked up and down in the cylinder the halves tend to rock and adjust themselves to whatever part of the cylinder wall they are at the time resting against. Thus such laps, while undoubtedly making the cylinder wall smoother, are quite likely to aggravate, rather than correct, out-of-roundness and lack of parallelism.

To do the best work with a lap—and no conscientious garage man wants to do any other kind—a rigid lap having at least four bearing places, should be used. It is easy to make such a lap in any machine shop, and in most garages.

First, turn up and thread an arbor of suitable size, and fit thereto two knurled adjusting nuts, or, if you do not have a knurling tool, drill holes in the nuts for a wire spanner. Next, put the arbor on centers in the milling machine with the tail center elevated (the amount of elevation is not important) and mill four flat *tapering* sides.

Then take a short piece of old pipe, or a bushing, about 4 or 5 in. long, having an inside diameter equal to a half inch or so more than the diameter you wish to make the lap, and set it up endwise on any convenient casting. Run one of the adjusting nuts on the small end of the arbor, flush with the end, to make a base for the arbor to stand on, and set the arbor inside the pipe.

Center the arbor in the pipe and fit four partitions of sheet brass, or preferably, of thin wood, to wedge tightly between the threaded corners of the arbor and the wall of the pipe. Into the mold thus formed pour molten babbitt.

When the casting has cooled sufficiently, drive it out of the pipe, put the arbor on centers in the lathe, turn the babbitt casting to the desired diameter of the lap, face the ends and turn the grooves for the snap rings as shown in the sketch. When this work is done, put the job in the arbor press and force the tapered arbor through, bursting the babbitt casting. It will be held only by the small amount of metal that has run through the threads under the partitions and will break apart without difficulty.

Dress up the rough edges of the parts, place them together on the arbor and snap in the steel wire rings to hold the parts together. Now run on the adjusting nuts and the lap is ready for loading.

You now have a rigid lap that will always have four bearing faces, that is capable of a great deal more expansion than any makeshift lap made from a piston, and that will always remain parallel. Further, it may be expanded and redressed to original size many times before it is worn out, and it can be replaced in half an hour.

One arbor will take care of many laps of different sizes, and if the parts are properly stamped on the ends and kept together in a suitable box, instead of being thrown under the bench, you will soon have a complete set to cover all sizes of cylinders that are likely to come in.

Machining Crosshead Shoes

By Charles F. Henry

The Union Pacific Railroad, shop Portland, Ore., has a method of planing crosshead shoes which obviates the necessity of putting the crosshead on the planer table for finish planing the shoes.

In machining the crosshead itself, the steel casting is first bored for the piston rod and wristpin and then mounted on a mandrel in the usual manner as shown in Fig. 1. But after both sides are planed for the shoes and the bolt holes drilled, the shoes are fitted and planed without again mounting the crosshead on the planer.

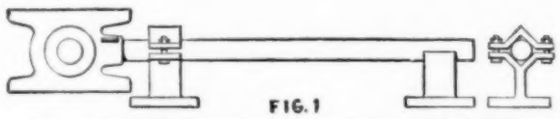


FIG. 1—METHOD OF HOLDING THE CROSSHEAD FOR PLANING

The shoes are planed on the underside to fit the crosshead, using simple fixtures shown in Fig. 2. Blocks *A* and *B* fit the planer table and make it easy to group several shoes. The dotted lines show how a second shoe can be mounted close to the first. The fixtures have tongues which fit the T-slots of the planer. The edges *C* and *D* of the shoes, which rest on the side walls of the crossheads are now planed for mounting.

After planing, the shoes are put in the crosshead as in Fig. 3 and the bolt holes drilled through the lower

portion, using the crosshead as a drilling jig. Bolts are put into the holes nearest the ends and the ends of the shoes scribed to show the proper depth for planing the bearing surface.

A plug *A*, Fig. 4, turned to fit the taper hole provided for the piston rod, is put into the crosshead. This

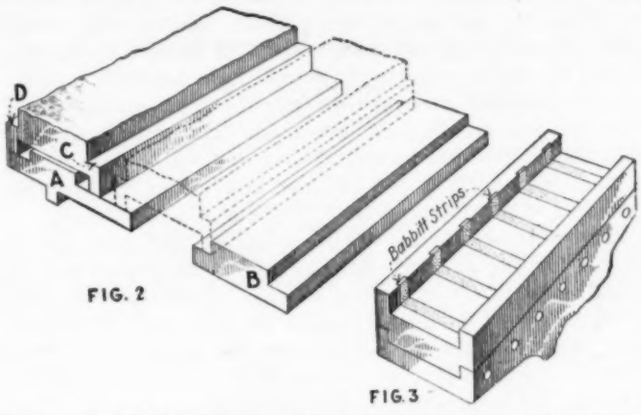


FIG. 2—FIXTURE FOR PLANING THE BOTTOM OF SHOE.
FIG. 3—USING THE CROSSHEAD AS A JIG

plug carries bent scriber *B* which can be adjusted and fastened at any desired radius by means of the screw *C*. The arc *D* is scribed on the ends of the shoes, the upper portion of the arc showing the planer hand the proper depth for the cut.

A shoe is then placed in the fixture shown in Fig. 5, with the undersides resting on planed surfaces of the

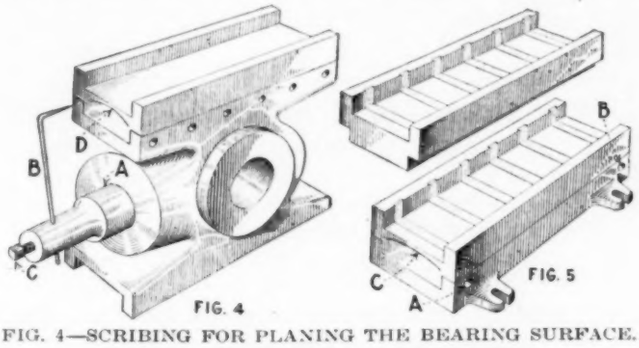


FIG. 4—SCRIBING FOR PLANING THE BEARING SURFACE.
FIG. 5—FIXTURE FOR FINAL PLANING

fixture which represents the crosshead. Bolts having eccentric bodies are put through the holes *A* and *B* at each end of the fixture and, when turned, the cam action beds the shoe firmly in place on its planed surface. As the arc *C* scribed on the end of the shoe, is the planing guide, there is no question as to the bearing surface of the shoe being the proper distance from the center of the crosshead.

Painting Oil Cans to Distinguish Them

BY A. W. FREEMAN

We use six different kinds of oil around the plant and had trouble from using the wrong kind, getting different kinds mixed in the same can, until we adopted the expedient of assigning a specific color to each kind of oil and painting the cans accordingly. Having once learned the code it is easy for a workman to pick up the can containing the kind of oil he wants without having to spill some of it out to find what kind it is.

An extension of the scheme was to paint the supply tanks in the tool crib with the corresponding colors, and now when a workman takes his can to the crib to be refilled, no questions need be asked and no mistake can be made; the attendant simply fills the can from the tank of the same color.

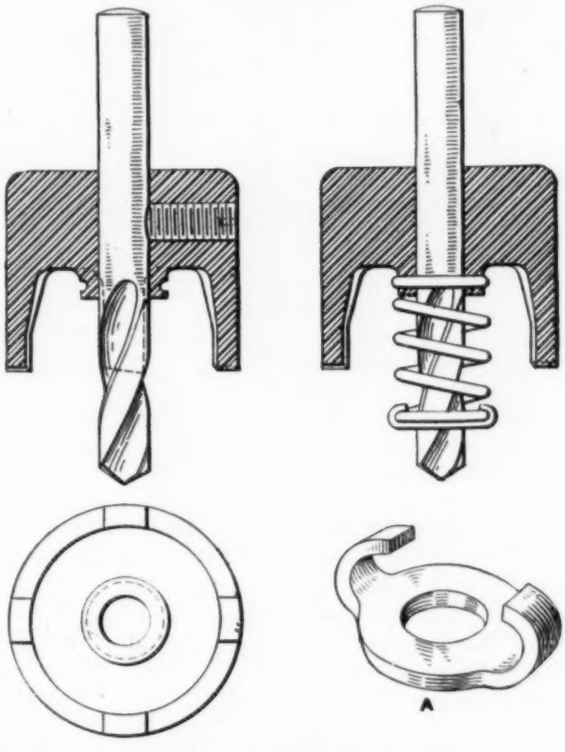
Our oil is received in metal barrels, and as soon as a shipment comes in, colored tags are attached to the barrels to show what kind of oil is in each.

A Tool for Cutting Thin Washers

BY GEORGE W. NUSBAUM

The combination drill and circular cutter shown in the accompanying sketch is one that I have found very useful for cutting thin washers of metal or of any of the insulating materials that can be machined. Also for cutting large holes in thin stock it is very efficient, as in making holes in the fenders of automobiles for the purpose of setting in parking lamps. A large drill cannot be used for this purpose, as it will not make a round hole but this device works very nicely, even when used in a hand or breast drill.

When used for repetition work, as in the cutting of



A TOOL FOR CUTTING WASHERS OF THIN METAL

thin washers, the spring and small washer shown on the tool at the right should be added. It will be noticed that the boss in the center of the cutter is provided with a small groove into which the coil at the upper end of the spring can be snapped, thus serving to hold it in place. The washer shown enlarged at *A* is made with two ears which are to be closed over the coil at the lower end of the spring. The spring and washer *A* serve as a stripper to eject the pieces from the tool.

Short ends of drills that have nearly outlived their usefulness may be used. The small drill passes through the thin material very readily and then acts as a pilot to guide the cutter.

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KENNETH H. CONDIT AND FRED H. COLVIN
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Another Convert to Decentralization

TO THOSE of us who have been connected with any of the big national engineering societies, the trend for decentralization is no new thing. The local section organizations of the mechanical engineers and the automotive engineers were planned with this idea in view, and have turned out to be based on sound reasoning. Some local administration difficulties have naturally arisen, but there can be no doubt that the local sections have brought many more engineers into contact with society activities than was the case before their inauguration.

There seems to be a rather well defined limit to the size which any national organization can reach before it becomes unwieldy. The same statement applies with equal force to business organizations and in this regard has led to some disastrous experiences. When that stage is reached, it becomes essential to work out some plan of division into smaller units, which are not too large to function vigorously. Each one must have a considerable amount of autonomy, as the leaders big enough to grasp all the details of extremely large organizations are very few indeed.

We are glad to note that the Chamber of Commerce of the United States has taken steps to follow the lead of the enginering societies in the direction of decentralization. Traveling is rather an expensive luxury these days, even for successful business men, and the idea of holding regional meetings cannot help but bring out a much larger attendance. We shall await with interest the announcement of the plan finally adopted by this great national business organization for increasing its efficinecy.

Making Machinery Fool Proof

THE EXPRESSION in the title means really the making of a machine so that even a fool cannot harm it. Of course it cannot be done and, also of course, that is not what is meant by the man who uses the expression.

Here is a machine of which a lever must be pulled upward in order to make a slide move downward. Somebody conceives the idea to change this condition—to move the lever in the same direction as the slide is to go, and he says that he is making the machine fool proof. He got the idea for this change because the machine had jammed, parts had been broken and customers had kicked, all because some operator was doing the very thing the designer is now trying to accomplish; move the lever as the slide should go. Was the operator the real fool or was it the designer?

What would you think of an automobile in which you must turn the steering wheel to the left in order to make the car go to the right? Where you would have to hook your toes under a shovel handle to operate clutch or brake; where you would have to push instead of pull the emergency brake lever? Do we really feel that the automobile has been made fool proof? Indeed not, for that would be confessing that we are the fools. Rather we say that the handles and levers in an automobile are so arranged that they operate naturally.

The automobile *had* to be designed that way for it is run by the average citizen, not by an expert and it requires such quick action in case of emergency, that even an expert would fail unless the required movements are natural. Machine tools on the other hand were almost universally constructed without any regard for the natural tendencies of the operator.

In recent years a number of machine tools have been brought out which show care and forethought on the part of the designer but even now machines are made which need foolproofing very badly. The designer studies the work which must be done on the machine, the tools to do it with, the mechanism and frame of the machine itself but often forgets the peculiarities or natural tendencies and reactions of the man who is to run it. Until we do this our machines will need foolproofing and until then there will be some people who will ask: "Who was the fool?"

Standardized Equipment for Automobile Service Stations

ANOTHER indication that the automobile business is rapidly losing the characteristics which led to its old designation as the "automobile game" may be found in the progress of the big service stations. The large companies have been working steadily on plans to sell service on a flat rate basis just as the shoe repairers and jewelers charge flat prices for new soles and watch repairing.

Some service stations are already on a flat rate basis as regards labor charges but still charge for parts as required. By this time next year, however, it seems likely that at least one company will have worked out averages for a large number of similar jobs and will be able to tell a customer beforehand exactly what any particular job will cost.

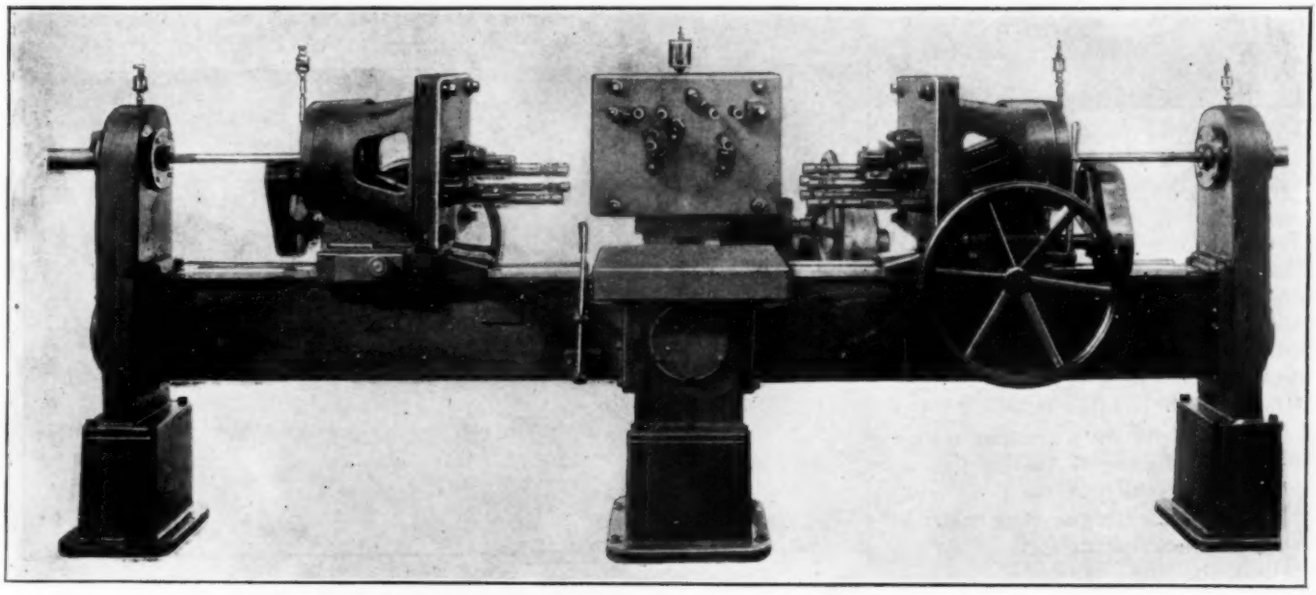
An important feature of this kind of service by a large chain of service stations is standardized shop equipment. Special tools for a certain job developed by a bright mechanic in one shop should be duplicated for use in all other of the many shops where the same job must be done.

Here is a new field for tool designers and machine builders. While it was hardly worth while to spend time and money in developing such equipment for one service station, no matter how large it might be, when there is a good chance of selling the same type of tool to all the stations in a big chain, the proposition takes on more of a commercial aspect and becomes attractive.

Shop Equipment News

Fox Three-Way Semi-Automatic Tapping Machine

A recent addition to the line of tapping and drilling machines placed on the market by the Fox Machine Co., Jackson, Mich., is the three-way semi-automatic tapping machine for cylinder blocks, the front view of which is shown in the illustration herewith. The machine has two side heads that tap holes in the ends of the cylinder block and a rear head that taps the holes in the side of the block.



FOX THREE-WAY SEMI-AUTOMATIC TAPPING MACHINE

One motor, located on a base behind the rear head, drives all three heads. The transmission is by a silent chain from the motor to the driving clutch, the reversing clutches being carried on the shaft running to the front of the machine. On this shaft is also mounted the chain and sprocket which drive the spindles in the rear head. The shaft extends to the front, where the bevel gears drive the horizontal shafts which carry the motion to the chain sprockets at each end of the front column. The power is then transmitted to the shafts that drive the spindle pinion gearing in the heads containing the tapping spindles.

By means of the lever shown at the left of the table which is in front of the rear head, the motion of all the heads can be started, stopped and reversed simultaneously. When the work is in position on the table the forward movement of this lever causes the taps to revolve in a right-hand direction. Since the heads advance at the same rate as the taps, perfect threads are assured.

The reversing is automatic, the heads all being returned at the same ratio until they automatically stop. Change gears are employed for each lead, which advance and return the heads in unison at a speed that corresponds to the pitch of the taps. These gears may be changed to accommodate taps of different leads. The tapping speeds are about 20 ft. per minute.

All the spindles are mounted on Fox cluster plates, which give sufficient rigidity, as the holding arms are doweled to the plate. The head at the left has four spindles carrying ⅜-in. 16-thread taps, while the heads at the right and the rear each carry six taps of this same size. The machine is driven by a 10-hp. motor running at 1,200 r.p.m. The total weight of the machine is 6,350 pounds.

Hele-Shaw High-Pressure Hydraulic Pump

By means of the high-speed high-pressure, rotary hydraulic pump shown in Fig. 1, a sensitive and accurate automatic or hand control of hydraulic power is provided. The pump can be used for supplying oil under pressure to presses of all capacities, cranes, steering gears and testing machines, and also as a means of supplying fuel oil to burners. It is claimed to maintain a constant pressure at all times, while automatically varying the supply

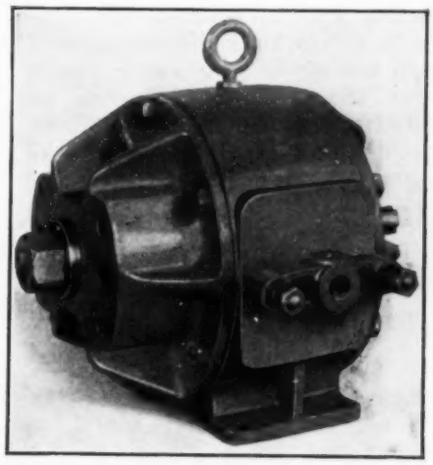


FIG. 1—HELE-SHAW HIGH-PRESSURE HYDRAULIC PUMP

from zero to the full capacity of the installation as the load demands. The pump has just been placed on the market by the American Fluid Motors Co., 2414 Aramingo Ave., Philadelphia, Pa.

The cylinder body of the pump is independently supported by ball

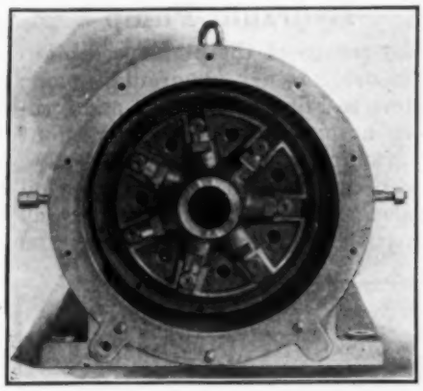


FIG. 2—EXPOSED END VIEW SHOWING CYLINDER BODY

bearings and is mounted on and rotated about a central hollow shaft. This hollow shaft is the valve of the pump and contains the inlet and exhaust ports for the fluid. While the cylinder body is a solid casting, it holds several radial cylinders, seven in the pump illustrated in Fig. 2. In each radial cylinder a plunger operates. This plunger is fastened to a gudgeon pin, which in turn engages in a groove of a circular ring casting known as the "floating ring."

Although the plungers always rotate with the cylinder body, the floating ring may or may not, as it adjusts itself to the operating conditions. The floating ring is supported on roller bearings, which may be shifted at will to either side of the center of the pump, carrying the ring with them. By shifting this floating ring, the length of stroke can be varied, and as the ring passes from one side of the center to the other, the direction of flow is reversed. The extent to which the floating ring is shifted from the center determines the length of stroke and, accordingly, the volume of fluid delivered.

The pumps are built in capacities ranging from 3 to 110 gal. per minute maximum discharge, and with maximum pressures ranging from 3,500 to 2,200 lb. per sq.in., respectively. All the pumps can be direct-connected to motors, and when so connected they require motors of 1,250 r.p.m. with horsepower ratings varying from 2.75 to 64.

"Lo-Hed" Mono-Rail Electric Hoist

The American Engineering Co., Philadelphia, Pa., has recently placed on the market the "Lo-Hed" mono-rail electric hoist, the side view of which with the cover removed, is shown in Fig. 1. A feature of this hoist is its low headroom, which enables it to be used successfully in rooms with low ceilings, or where a definite headroom must be maintained for the sake of safety, and also where pieces of large dimensions are handled.

As shown in the illustration, a fully enclosed motor is employed which is suitable to the type of work the hoist is to perform. This motor is of standard type; and can be removed without disturbing the other parts of the hoist, even with a full load on the hook, if necessary. It is equipped with ball bearings and a large diameter shaft. A dust- and moisture-proof controller is provided, which is held in the "off" position by a return spring. As soon as the operator releases the pull on the controller handles, the hoist stops.

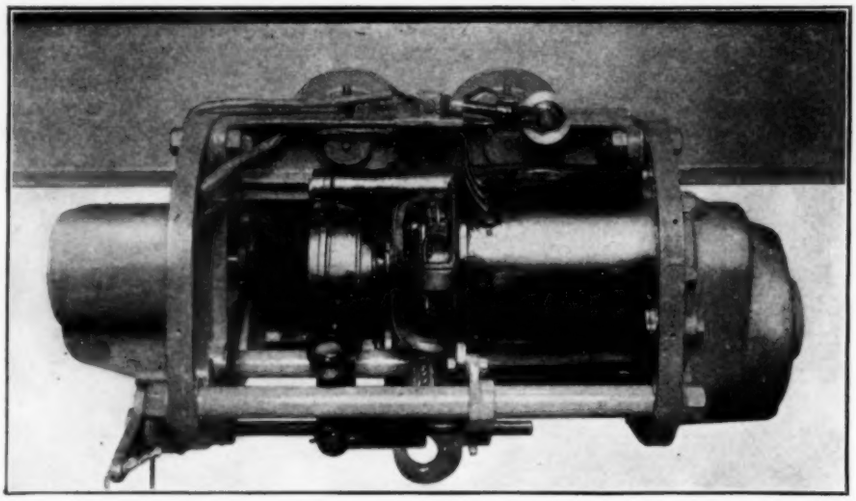


FIG. 1—EXPOSED SIDE VIEW OF "LO-HED" MONO-RAIL ELECTRIC HOIST

All the shafts are of high-carbon steel, with roller bearing races pressed on the ends. Hyatt "high-duty" type roller bearings are used throughout. The hoisting drive employs spur gears made of forged steel and contained in the end housing, as shown in Fig. 2. All gears can be removed from their shafts. They operate in a bath of oil and automatically "splash lubricate" all the main bearings. The Alemite system is used for all bearings not oiled by the reservoir splash system.

The end housing also contains the automatic lowering brake, which runs in an oil bath and is provided to control the lowering speed. It is of the screw and disk type, is geared to the intermediate shaft and has three disks. An automatic holding brake works on a pulley mounted on the shaft of the hoisting motor. It is operated by a cam on the controller shaft and has asbestos brake band lining. When the load block has reached its upper limit of travel, an automatic device serves to break the electric circuit and thus bring the holding brake into action.

A four-part rope block is supplied, which has a steel yoke and a forged steel hook, working on a swivel. The hoisting drum has right- and left-hand grooves, which coil the rope in a single layer and are of sufficient depth to take the full diameter of the cable. The plow steel hoisting cable is connected to the exterior of the drum in a manner to facilitate easy removal and replacement.

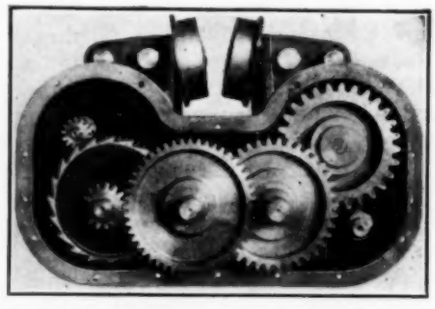


FIG. 2—END HOUSING SHOWING GEARS

The hoists are made in two types. Type H has either a plain or motor trolley, with capacities ranging from 2,000 to 12,000 lb., while type B can

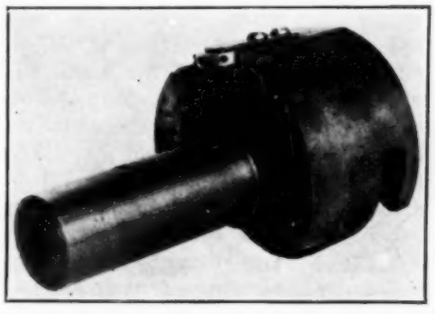
be furnished without a trolley or with the plain trolley. Its capacities range from 1,000 to 6,000 lb. The hoist is regularly equipped with a single-speed, rope operated, a.c. controller or a three-speed, rope operated, d.c. controller. Dynamic lowering (foundry type) or remote control type controllers can also be furnished. The headroom required on these hoists ranges from 10 in. on a 1-ton hoist to 14 in. on a 3-ton hoist.

Allan "Cyl-Grind" Portable Internal Grinder

The accompanying illustration shows a portable, adjustable grinder, known as the "Cyl-Grind," that has recently been placed on the market by the Allan Manufacturing & Welding Co., Buffalo, N. Y. While intended for the removal of excess metal and high spots on cylindrical surfaces, it may be used on flat surfaces as well.

The grinder can be adjusted or set to suit the radius of the cylinder it is desired to finish, and it is said to leave a smoothly ground surface. This setting may be made while the wheel is in motion and the legs of the main housing are resting on the cylinder wall, by first loosening the locking wedge and then lowering the drive shaft bearing or housing that carries the grinding wheel. When the desired adjustment has been made the locking wedge is tightened, thereby locking the drive shaft in the main housing. The grinding may then be started.

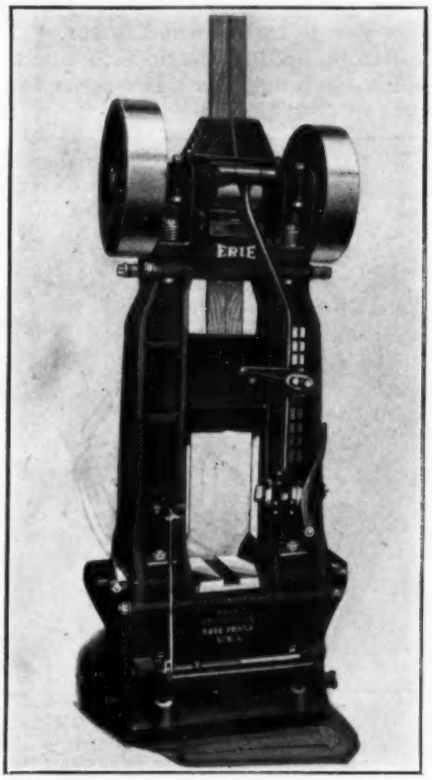
Two sizes are available, Type A for automobile cylinder blocks and Type B for air, steam and water cylinders of the larger diameters. The former type is for radii from 2⅛ in. to flat, has a wheel 2x1¾ in. and requires a ½-hp. motor. The latter is for radii from 4¾ in. to flat, has a wheel 4x1¾ in. and requires a ¼-hp. motor. Both types may be supplied with a motor and flexible shaft.



ALLAN "CYL-GRIND" PORTABLE INTERNAL GRINDER

Erie Board Drop Hammer

Among the outstanding features of a board drop hammer, shown in the illustration herewith, that has recently been developed by the Erie Foundry Co., Erie, Pa., are the wedge adjustment of the frames across the anvil, the use of the bolts and separators between the frames



ERIE BOARD DROP HAMMER

at the bottom and an improved type of latch. The use of wedges for adjusting the frames across the anvil was formerly employed on heavy steam hammers, and its use eliminates the screw adjustment.

Another factor tending to maintain the alignment of the whole machine is the use of tie bolts and separators between the frames at top and bottom, both front and rear. The separators prevent binding of the ram in the guides and yet minimize the amount of play.

Several improvements have also been made in the operating mechanism. When the friction bar drops vertically in the guides, the latch bar is moved by the descending ram from under a block which fits against a shoulder on the bar. As the ram ascends, a hickory pin strikes one end of the roll release lever, which is pivoted on a block clamped to the friction bar, and thus the friction bar is lifted gradually and without shock. The other end of the roll release lever bears on a pin which is adjustable up and down on a rack cast on the frame, by means of which the length of stroke can be varied. A crosshead construction is used at this point to reduce the wear and shock. The point of knock-off can be conveniently changed by means of an adjustable screw.

Anvil blocks are available in the ratio of 15 to 1 or of 20 to 1 to the weight of the ram and can be furnished as either semi-steel or open-hearth steel castings. The sow block is of forged steel and is held in the anvil by planing the side opposite to the key to a V, tapering at a 10-deg. angle each way, and also tapering in a vertical plane. No dowels are required and it is claimed that the harder the block is hammered the tighter it is held.

Chrome-nickel steel forgings are used for the various parts of the latch and roll release mechanisms, as well as the friction bar, roll shafts and the housing bolts. The ram is an open-hearth steel casting, cast by a special process to obtain a dense structure of metal. All the main bearings are phosphor-bronze bushed. Like the anvil, the standard frame is made from semi-steel, but it can be furnished as an open-hearth steel casting. The ram is available in either forged or cast steel, and the pulleys in wood, paper or steel.

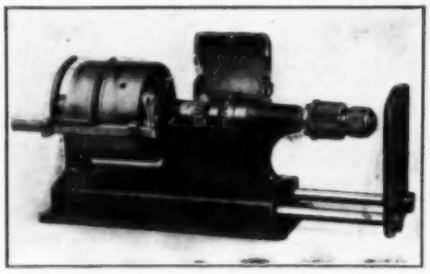
These drop hammers are built in seventeen sizes having rams weighing from 200 to 4,000 lb., inclusive, and with ram areas of from 7x9 in. to 26x24 in. The over-all heights from the floor to the top of the board when raised to give the extreme fall vary from 10 ft. 8 in. to 22 ft. 6 in., while the frame lengths vary from 50 to 128 inches.

Procunier Bench Tapping Machine

An improved clutch mechanism, a "double-jaw" chuck and a safety friction slip are features of the bench tapping machine illustrated herewith and recently placed on the market by William L. Procunier, 18 S. Clinton St., Chicago, Ill.

The clutch is of the ring type that engages instantly when the machine is reversed. It can be easily replaced when worn out. A hardened steel "double-jaw" chuck provides the gripping mechanism. With this

chuck, the tap is gripped on the squared end with one pair of jaws, and on the round shank with the other. This double hold increases the life of the tap, since it is driven by the jaws holding the square of



PROCUNIER BENCH TAPPING MACHINE

the tap and merely gripped and centered by the jaws holding the shank. The safety friction also prolongs the life of a tap for when the tap hits the bottom, the safety friction members slip and prevent the tap from breaking.

The machine can be furnished in four sizes having jaw capacities of 0 to $\frac{3}{32}$ in., $\frac{1}{8}$ to $\frac{7}{16}$ in., $\frac{7}{16}$ to $\frac{5}{8}$ in. and $\frac{1}{2}$ to $\frac{7}{8}$ in., respectively, and made with or without the safety friction attachment.

The Microgage

The precision tool shown in Fig. 1, designed to supplant snap and limit gages as applied to repetition or production work, has been placed on the

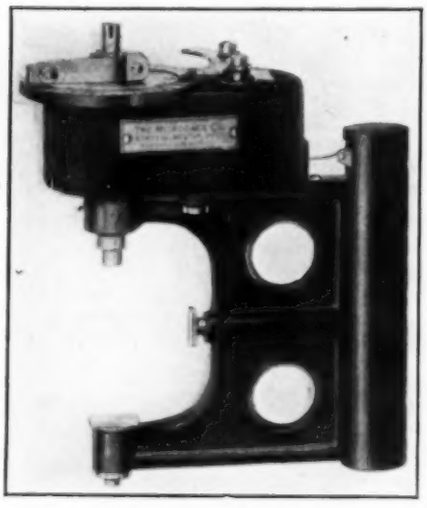


FIG. 1—THE MICROGAGE

market by the Microgage Co., P.O. Box 1,126, Boston, Mass. As its name implies, the tool is a gaging rather than a measuring instrument and, though it indicates variations in size directly in thousandths of an inch, its office is that of a comparator determining by what amount a piece of work departs from the exact size of the standard to which the tool has previously been set.

Its principle is that of a micrometer screw, which is turned into contact with the work by the tension of a spiral spring and governed by retarding and locking devices so that the pressure of contact is always uniform and is not subject to variation due to the personal factor.

Before issuing the tool to a machine operator, the gage setter or

FIG. 2—MEASURING DIAL ON MICROGAGE

foreman adjusts it to give a zero reading upon a standard plug or gage block of the size required to be duplicated. The zero line of the dial then corresponds to a mark at the center of the right-angled portion of the pointer, as shown in Fig. 2. This arrangement makes a convenient tolerance indicator when gaging the work, as any deviation of the work above or below standard is instantly shown, both in amount and direction, by the position of the zero line of the dial in relation to the stationary pointer.

The microgage is a "one-hand" tool. To apply it to the work the dial is turned back sufficiently far to allow the work to clear the measuring spindle, in which open position the latter is held by the automatic brake. As the work touches the central button, the brake is released and the measuring spindle is rotated by the driving spring until it contacts with the work, in which position it is locked and the tool may be withdrawn for reading. It is thus applicable to the work in any position.

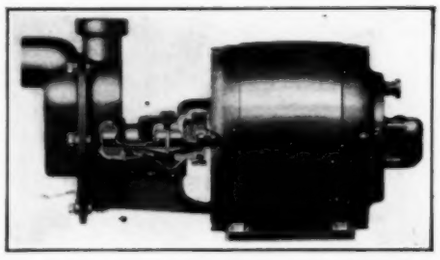
The tool is made in sizes from 1 in. to 5 in., increasing by half inches, as the range of each individual tool is $\frac{1}{2}$ inch.

Arrow Motor-Driven Centrifugal Coolant Pump

The ring-oiled packing gland feature described on page 77, Vol. 55, of the *American Machinist* is included in the motor-driven centrifugal coolant pump recently placed on the market by the Arrow Pump Co., Buhl Building, Detroit, Mich. While this pump is adaptable to a number of uses, it is primarily intended for circulating the cutting lubricant to cutting tools in machine shops, since its construction is such as to resist the injurious effects of abrasives present in coolants.

The pump is of the centrifugal type with only one working part, the impellor. A priming chamber enables it to retain its prime, and to work within its suction capacity above the level of the supply without the use of a mechanical prime retainer such as foot or check valves, which in this type of service are not dependable on account of dirt and chips preventing them from seating tightly. The construction of the pump prevents the liquid being pumped from coming in contact with the bearings, and provides a positive supply of oil to the bearings by means of the ring oilers.

The unit has a capacity capable of



ARROW MOTOR-DRIVEN CENTRIFUGAL COOLANT PUMP

supplying a group of machines from a central supply, and thus serves to eliminate the use of the small individual pump on each machine. The entire unit is compact, requires no base and can be assembled for either floor or side wall mounting. It is claimed that as both motor and pump bearings are ring-oiled from large oil wells, the pump may be located in isolated places where it will require little or no attention for long periods of time.

News Section

Eight-Hour Day Favored By Engineers

Leading engineers join in a public statement in favor of the eight-hour day in the steel industry. The statement was issued following a meeting held in New York recently between Dr. Mortimer E. Cooley, president of the Federated American Engineering Societies, and Dr. Harrison E. Howe, chairman of the committee on work periods in continuous industries. L. W. Wallace, executive secretary of the federated societies, joins in the support of the eight-hour day.

The statement of the engineers says in part:

"It is the business of the engineer to bring about a better social order. It is up to him to ascertain the exact conditions of industry as they affect both employer and employee. Naturally this embraces the question as to how many hours a day a man should work. To answer this question the engineer has made a scientific attack on facts.

"The committee which had this inquiry in charge has spent more than two years in the investigation of forty-three continuous industries—industries running twenty-four hours a day, and observed conditions affecting every class of continuous worker, from the bellhop to the steel worker. It was found, indisputably, that the twelve-hour shift is not economically necessary and that continuous industry can be run with a profit with the shorter working day.'

Second Hearing for Rail Consolidation

Further consideration by the Supreme Court of the Southern Pacific-Central Pacific R.R. merger was suggested by the Department of Justice in a brief filed recently at St. Paul before the Federal Circuit Court.

In view of the conflict between the Supreme Court decision ordering the Southern Pacific to release its hold on the Central Pacific and a later Interstate Commerce Commission order permitting the combination to continue on the ground of public interest, the Government suggested that the highest Court should give new consideration to the whole matter.

No Complaint on Business In Pittsburgh

Pittsburgh dealers in machine tools continue to report business as good, and in some places improving right along. Among the big companies giving out orders in the past two or three weeks is the National Tube Co., which is constantly adding to its lists of tools of every description. There have been some railroad orders placed in this district in the past ten days, giving a little tone to the buying movement, which already has a carrying momentum.

Nearly all of the electrical establishments in Western Pennsylvania are rushed with new orders, and are still behind in old deliveries, so that their need of machinery and machine tools has not abated. The Westinghouse companies have all been ordering heavily in the past few months, and will still keep on ordering, for they are behind with old orders, especially in electric motors.

In the smaller machine parts there are orders coming in daily that in the aggregate make a fair day's business. With a number of crane awards being made every once in a while, the dealers are able to dispose of one or two tools at a time every day or so. Dealers are looking for something by way of announcement by the Pennsylvania R.R., ordering machinery and tools for the shops at Conway, not far from Pittsburgh.

Arguments for Railroad Merger Heard

Plans of the New York, Chicago & St. Louis (Nickel Plate) R.R. holders to consolidate that property with the Toledo, St. Louis & Western, Lake Erie & Western and other railroad companies were questioned recently by Interstate Commerce Commission examiners assigned to make preliminary investigation, who suggested that the proposal might be out of harmony with the provisions of the Transportation Act and with the general program of railroad consolidation.

The commission, however, declared the report not "to be interpreted as reflecting tentative conclusions" and set the questions for hearing and argument for June 9 before the full commission.

Credit Situation Sound Says Tregoe

The credit situation is absolutely sound and there is justification for nothing but optimism as to the future of business, according to the June monthly letter of Secretary-Treasurer J. H. Tregoe, now on its way to the thirty odd thousand commercial and banking credit managers who represent their concerns in the National Association of Credit Men.

This observer says that a sifting process is going on, a separating of the sheep from the goats. Skillful business administration is meeting present emergencies, while enterprises unskillfully administered are going under or finding it extremely difficult to come through with a profit. The lesson in this is that slipshod methods are certain to pull a business down, that business must be organized and conducted with a fearless demand for good system.

Reverting to the conditions of two months ago, when production was in many lines apparently at its capacity and everything seemed to be moving carefree, there were distinct evidences of overplay and of tendencies that would result in reaction, says Mr. Tregoe.

Advertising Clubs Meet In Atlantic City

Advertising in all its phases was discussed at the nineteenth annual convention of the Associated Advertising Clubs of the World, which opened Monday on the Steel Pier, Atlantic City, and continued until Thursday. It was the largest convention in the history of the advertising profession.

Len D. Alga presided at the first session which was termed an inspirational meeting and Lou E. Holland presided at the general meeting that was held directly following. In the afternoon C. K. Woodbridge, president of the Dictaphone Corp. presided. Tuesday was called the open session day when many sub-sessions were held. On Wednesday W. Frank McClure, vice-president of Albert Frank & Co. presided and Thursday morning Mr. Holland again assumed the chairmanship.

Speakers of note who were on the various programs were: Fred B. Smith of the H. W. Johns-Manville Co., former Senator Walter E. Edge of New Jersey, W. S. Crawford, a British advertising man, Robert Lynn Cox, vice-president of the Metropolitan Life Insurance Co., Frederick M. Feiker of the McGraw-Hill Co., Floyd W. Parsons, a writer on economic subjects for the *Saturday Evening Post*, George M. Graham, vice-president of the Chandler Motor Car Co., Carl Williams, president of the Cotton Growers Exchange, E. T. Meredith, former secretary of agriculture, Roger W. Babson, a writer of economics and finance, G. Lynn Sumner, advertising manager of the International Correspondence Schools, Stanley Q. Grady, director of sales and advertising for the Dairymen's League, and many others.

While the main meetings were in session, there were scores of specialized gatherings in hotels throughout Atlantic City. These included Advertising Specialty Association, Agricultural Publishers Association, American Association of Advertising Agencies, American Photo-Engravers Association, Associated Business Papers, Associated Retail Advertisers, Church Advertising Department, Community Advertising Department, Direct Mail Advertising Association and Graphic Arts Association, Directory and Reference Media Department, Financial Advertisers Association and Industrial Advertisers Association and many other affiliated associations.

Also dealing with their problems were the National Association of Newspaper Executives, National Association of Theatre Program Publishers, Poster Advertising Association, Public Utilities Advertising Association, Screen Advertisers Association, Association of Newspaper Classified Advertising Managers, Conference of Advertising Women, Club Secretaries' Conference, Educational Conference, National Association of Teachers of Advertising and a meeting of insurance advertising men.

Railroads Argue Cause Before Coal Probe

Adoption of a policy by the American people which will ensure the railroads of this country fair treatment and enable them to work out their problems without fear of action "of a confiscatory nature" for a time at least was urged in a report filed this week with the United States Coal Commission by a special committee appointed by the American Railway Association to render such assistance as possible to the fact finding Commission.

The report supplements a preliminary one filed five months ago by the special committee of which J. E. Roberts, of Albany, N. Y., superintendent of transportation of the Delaware & Hudson Co., is chairman.

In concluding its report as to the causes of the fuel situation and possible remedies the report said:

"There can be no doubt that the railroads of the United States are vitally interested in the work of your Commission. It has been said that the principal problem of the coal industry is the problem of distribution. Without committing ourselves to the absolute correctness of this statement, we are sensible of the fact that the coal industry cannot be put upon a sound basis acceptable to the American people unless coal is transported with reasonable promptness and in the most efficient manner. It is the task of the railroads to furnish this transportation. This task has been rendered difficult by certain features characterizing the production of coal which your Commission thoroughly understands and which all students of the problem are endeavoring to eliminate.

STEADY TRANSPORTATION

"It is clear that if some method could be devised whereby the amount of coal which the country demands could be removed throughout the year in fairly constant quantities so that heavy seasonal movements would be avoided, the railroads of the country are sufficiently equipped to take care of the demands upon them in a satisfactory manner. Even if allowance is made for an increased demand for coal during the period of heaviest domestic consumption the railroads could meet the situation without serious cause for complaint. But the railroads do not feel that they are properly censurable for not being able to meet all the demands for transportation in years when strikes in the coal industry have stopped production for a considerable period making it necessary to crowd a year's business into a few months and that too at a time when there is the heaviest movement of other seasonal commodities."

The report calls attention to overdevelopment in the bituminous coal industry. In 1921 there were 8,038 mines, exclusive of wagon mines, in operation, an increase of 38 per cent over the number in 1910, while there was no increase in production.

"This means," said the report, "that the railroads were called upon to divide equipment and other transportation facilities among 2,221 more mines than would have been necessary had the average production per mine been maintained on the 1910 basis."

In 1920, according to the report, bituminous coal mines ordered 16,357,514 cars, which on the basis of an average loading of 50 tons per car would have transported 817,876,000 tons. Actual production of the mines was 568,667,000 tons. The tonnage for which cars were ordered, the report points out, was therefore in excess of the tonnage actually produced by 249,209,000 tons or by 44 per cent.

The report says that there has been a general increase in efficiency on the part of the railroads in freight transportation in recent years. In 1922, the report said, Class One railroads handled 19.2 per cent more revenue freight, measured in net ton miles, with 9½ per cent less freight train miles than in 1914. In 1921 the performance was 7.7 per cent more freight traffic than in 1914 with 13½ per cent less train miles.

Survey Shows New York To Be Prosperous

Detailed analysis of the conditions of industry in New York State, just completed by the National Association of Manufacturers and made public recently, indicates that business is in a healthy condition and that prospects for Fall are equally bright.

The survey disclosed that there is an increase of employment, many factories finding difficulty in keeping their forces complete; wages have increased; sales are keeping up with production and passing it in some instances, and there has been an almost total absence of labor disturbances.

Industry Remains Active Report Shows

Most manufacturers of iron and steel castings have continued to receive substantial business from the machine tool and various other industries, and factories making machinery and machine tools have, in general, been busy on orders from textile plants, automobile manufacturers, sugar refineries, and the building trades, states the official publication of the Third Federal Reserve District, Philadelphia. It is apparent that the demand for heavy products is considerably easier, but the lull in buying has as yet affected few of the specialties. The decreased buying is reflected in the unfilled orders on the books of the United States Steel Corp., which fell from 7,405,332 tons on March 31 to 7,288,509 tons on April 30, a decline of 114,823 tons. This decrease is the first one reported this year.

As far as can be determined, finished stocks in most cases are only moderate and are decreasing. This gives strength to the view that consumption has kept pace with production. In many instances production schedules continue to be curtailed by lack of labor. Manufacturers are almost unanimous in their reports of shortage of workers, and numerous advances have been made of from 5 to 15 per cent in wages. In many instances, however, these increases have not appreciably relieved the shortage.

Machinery and Machine Tools Form Interesting Exhibit at Gothenburg Fair

Perhaps the most striking and well planned exhibition of machinery, machine tools, and inventions to be seen in Europe this year is the machinery exhibit of the Jubilee Exposition in Gothenburg, Sweden, that began May 8 and continues until September 30. Most of the exhibits are arranged in the great machinery hall, a gigantic wooden structure built for the occasion. Other exhibits are to be seen in surrounding buildings, especially the displays devoted to the history of machinery showing the development of certain mechanical principles throughout the centuries.

All the exhibits at Gothenburg are collective, that is, all firms manufacturing the same kind of article show in one display, thus making it easier for the visitor to take in at a glance what is shown. Among the things which are creating most interest at Gothenburg this year are the great Diesel motors. Other things that are interesting travelers are the Ljungstrom turbine engine; the vapor accumulator and the air preheater for saving steam and fuel; the Dalen aerial signal lights with the Dalen sun valve that turns these lights on and off automatically at dark and at daybreak, light causing the valve to expand and so turn off the mechanism and darkness causing it to contract and turn it on. Other interesting exhibits are those of machine tools and tool steel, the SKF ball bearing exhibits, the de Laval separator exhibits, various regulators for electric current, gas, fluids and moisture, automatic switches, and other new devices.

MACHINERY HALL, GOTHENBURG FAIR, SWEDEN

A. S. M. E. Spring Meeting at Montreal

Many brilliant papers are read at the sessions held this year at Montreal with the Engineering Institute of Canada—Excursions and inspection trips were both enjoyable and educational—Fred R. Low nominated for president

THIS year's Spring meeting of the American Society of Mechanical Engineers was held at the Mount Royal hotel, Montreal, May 28-31. It was somewhat in the form of a joint meeting, the Engineering Institute of Canada acting as host and providing some of the papers.

The advance guard reached Montreal Sunday morning and spent the day looking over the sights and renewing old acquaintances. On Monday morning the council met and in the afternoon a business meeting was held. At this session President John L. Harrington introduced President Francis of the E. I. C. who welcomed the delegates to Montreal. Mr. Harrington then announced to those present that the next Spring meeting would be held in Cleveland and introduced John Price Jackson of Philadelphia, who addressed the meeting on the plans being made for the sesquicentennial celebration to be held in 1926 in Philadelphia.

VIEW OF MONTREAL

Mr. Jackson told of the great exhibits of industry and the arts that are being provided for, but said that the underlying thought in the plans for the celebration was one of education and inspiration of the world in fields of peaceful endeavor. He emphasized the international character of the exhibits and of the various gatherings to be held.

Following Mr. Jackson's address, Calvin W. Rice gave his illustrated talk on his trip to South America. In the evening there was a joint dinner of councils of the two societies at the St. James Club.

Inspection Trips

On Tuesday afternoon the power members inspected the Cedar Rapids hydro-electric plant, while the rest of the party visited the Angus shops of the C. P. R. A special chair-car train was put at the disposal of the visitors and the hospitality of the railroad company in the form of liquid refreshments and smokes was thoroughly enjoyed. A most remarkable incident was the fact that on the return trip every bit of ginger ale was consumed before the train left the shops. Just why this should happen while there was still a copious supply of ale and lager rather passes comprehension.

In the evening a smoking concert was tendered to the A.S.M.E. by the E.I.C. while the ladies were entertained at bridge in another part of the hotel.

On Wednesday morning the power, materials handling and textiles divisions held meetings and in the afternoon an inspection trip of the Montreal harbor was made by one group while others visited several of the big breweries. A dinner dance ended the day.

Three sessions were held simultaneously on May 29, these being power, management and railroad. The first under A. G. Christie had two papers, "Power Development in the Province of Quebec" by Julien C. Smith and one on the "Development of Hydro-Electric Power Plants in Ontario" by Frederick A. Gaby. Both are members of the Engineering Institute of Canada and Mr. Gaby is also a member of the A.S.M.E. Past President Kimball presided at the meeting on Management at which R. B. Wolf presented a paper on "Management Engineering in the Paper Industry" and Myron A. Lee a paper on "A Practical Laboratory and Drawing Room Course in Industrial Engineering."

Two Railroad Papers

The railroad session, under H. H. Vaughn had two very interesting papers, the first on "Steel Car Construction at the Angus Shops of the Canadian Pacific Railway," that appears elsewhere in this issue of the *American Machinist* by one of its engineers, H. R. Naylor, and the other on "Some Recent Developments of the Motor Coach" by C. E. Brooks, chief of motive power of the Canadian National Railways. Mr. Naylor showed how fixtures and assembling methods increased the efficiency of steel-car building, and also cited savings due to improved methods of painting lumber for wooden cars. A special painting machine gives the boards a priming coat as they come from the planer and handles them as rapidly as they can be planed.

Mr. Brooks pointed out the developments in motor-driven cars for use on feeder lines where a frequent service was necessary to build up a business. He discussed steam, internal combustion and storage battery cars and pointed out the requirements of the various kinds of service for feeder lines. He feels that the small car, seating from 24 to 40 persons and weighing from 18,000 to 30,000 lb., is solved very satisfactorily by the gasoline motor of the automobile type. Larger units, to seat from 40 to 60 people and to carry more baggage, bringing the weight up to 50,000 to 75,000 lb. presents a more difficult problem.

The storage battery car has advocates for both services, but in Mr. Brook's opinion, was much more suitable for the heavy car class. He brought out the interesting fact that internal combustion motors had a much longer life in vehicles running on steel rails than in motor cars that run on the highways and placed the life of a motor in this service at from 100,000 to 200,000 miles without the serious replacement of parts. This seems to score a point over the motor bus.

Wednesday's sessions were devoted to power, port development and textiles. The first, under L. H. Lawrence, dealt with "Modern Hydraulic Turbines of Large Capacity" by H. G. Acres of the E.I.C. and "Sectionalization and Remote Control of High Pressure Steam Lines" by Peter Payne Dean. H. V. Coes presided over port development at which Fred M. Cowie, E.I.C., presented the "Harbour of Montreal" and Carroll R. Thompson gave some factors of "Materials Handling Influencing Pier Design." The committee on formulas also made a report. Under the textile division, F. P. Bascom and J. C. McDowell presented a paper on "Bleachery Engineering and Operation." C. R. Main presided.

Machine Shop Practice

The machine shop session was presided over by F. O. Hoagland, chairman of the Machine Shop Practice Division, the first paper being by C. R. Soderberg of the Westinghouse Electric & Manufacturing Co., on "Recent Developments in Balancing Machines." He showed a new type of machine which has been developed especially for the balancing of rotors used in electrical machinery but is, of course, applicable to other kinds of rotating bodies. This was discussed by Messrs. Eaton and Britton, both of the same company. R. G. Nye of the Buffalo Steam Pump Co. was interested in its application to centrifugal pumps and C. A. Johnson

of the Gisholt Machine Co. sent in a description of its precision balancing machine.

Following this was a symposium on "The Machine Tool and Paper Industry." It began with an introduction by G. E. Williamson and was followed by two papers, the first being on "Shop Problems in Paper Machine Manufacturing" by E. P. Spidy of the Dominion Engineering Co. This paper was fully illustrated with a number of very interesting lantern slides showing some of the methods used in handling the large calendar rolls and other parts of huge paper-making machinery. The subjects were covered so thoroughly that discussion was practically eliminated. The second, a paper on "Pulp and Paper Mill Repair Shop" by Edw. Hutchins, was read by K. H. Condit in the absence of the author. Mr. Hutchins pointed out the special problems of repairing paper mill machinery, showing how this work differed from the ordinary machine shop and listing the machines necessary for the work in the average paper mill.

There were several other contributions to this symposium but as none of the authors were present and time was limited, they were presented by title only. They were: "General Requirements of Machine Tools for Paper Machinery Manufacture" by George Barton; "General Requirements of Machine Tools for Pulp and Paper Machinery Manufacture" by L. Kutter; "Plant Equipment Necessary for Producing Paper-Working Machinery" by James A. Cameron, and "Machine Tool Requirements of Pulp and Paper Mills" by E. B. Wardle.

BUSY SESSIONS

Other sessions for the day included papers on "Fuels" and one in the general session on "The Control of Civil Aviation" by J. A. Wilson of the E.I.C. This finished the technical sessions.

The local entertainment committee deserved great credit for the various excursions both as to the planning and the way in which they were carried out. The first was by special train to the Angus Shops of the Canadian Pacific Railway. This plant covering an area of 250 acres and including a self-contained power plant, a gray iron foundry, a wheel foundry with a capacity of 300 wheels a day, frog switch and bolt shops for the entire equipment of the eastern lines of the C.P.R., in addition to its locomotive and car shops which both repair and manufacture. An alternate excursion was to the Cedar Repids Mfg. & Power Co. with its fourteen 10,500-kw. generating units and plans for an ultimate capacity of 180,000 kilowatts.

There was also an excursion around the harbor on the commissioner's boat which visited the grain elevators, cold storage warehouses and other port facilities. This was particularly interesting from the fact that in 1922 Montreal handled 154,550,000 bu. of grain, the largest quantity handled by any port on the American continent. There were also excursions to McGill University. Another special train took the party to the plant of the Dominion Engineering Works which was originally constructed for the fabrication of the Quebec bridge and is now manufacturing hydraulic turbines and paper machinery on a large scale. Most of this party continued to the Lachine Wharf and took the steamer Empress for a trip through the Lachine Rapids. Another, and the most pretentious excursion, left Montreal at midnight of May 31 for a visit to the St. Maurice Valley which included a visit to the Laurentide power house and paper mill at Grand Mere. The Canada carbide plant and the Belgo paper plant were also open for inspection. After lunch a trip was made to the plants of the Shawinigan Water & Power Co. with its 225,000 hp. and a power plant development at La Gabelle with 150,000 hp. under construction. Few realize the extent of water power development in this section and these excursions were extremely valuable on that account.

The nominations for the coming year are as follows: For president, Fred R. Low; vice-presidents, Geo. I. Rockwood, Morris L. Cooke and W. J. Sando; managers, E. O. Eastwood, Frank A. Scott and E. R. Fish; American Engineering Council, D. S. Kimball, M. Schwanhauser, S. W. Stratton, F. F. Walker, F. K. Copeland, J. T. Faig, R. E. Flanders, C. C. Thomas and W. B. Powell; treasurer, Wm. J. Wiley.

St. Louis Expects Gains In Fall Business

Most of the machine shops in St. Louis are working full time due to orders that they have on hand and there is every indication that there will be continued work for at least a month or more. Deliveries for the Fall and Summer months are scheduled and, while new business is not coming as fast as was indicated for the first few months of the year, men in the industry are optimistic as to the future.

The excellent condition of the country at large makes it obvious that temporary lulls cannot persist and despite the seasonal falling off of business and the quietude in the oil fields at the present writing, there is every reason to look forward to better business in the early Fall and Winter of the year.

Railroads seem to be waiting for some move on the part of the government toward more favorable legislation and in the interim are slow on the purchasing of machine tools.

As long as the workers are well occupied and deliveries are a daily occurrence, the manufacturers in the Southwest are hopeful and pride themselves on being resourceful enough to overcome any possible "slump."

Ford Production Will Be Maintained

"The Ford Motor Co. will maintain its present record output not only through the current Spring, and Summer months, but all through the Winter as well," Henry Ford states in a message to the *Wall Street Journal* from Detroit.

"We need all our profits for the expansion of our business and the employment of more men," he continued. "We are now making between $8,000,000 and $10,000,000 a month."

Tractor production has reached 550 a day, but Mr. Ford believes it will not become profitable until an output of 1,000 daily is attained. He takes a long-range view of the tractor. He believes he is serving the farmer by its production even at a loss and that his profits come back through increased rural prosperity and stimulated purchasing of Ford automobiles.

Textile Mills Prove to Be Good Buyers

Textile mills in New England are good customers of New York machine tool dealers and it is reported that much machinery and machine tools have been delivered to this district within the past week. Another good outlet for work has been in the factories that have been needing special built machinery.

The automotive industry has been an excellent customer in New York and big purchases have been made by Eastern railroads for shop equipment. Not much more business is looked for from automotive manufacturers as they have bought most of the necessities for the season. Still, if the production of automobiles keeps up to the present rate, there is every chance that new machinery will be needed in the Fall and perhaps before.

Railroad inquiries are fewer than they have been and purchasing does not follow as quickly as was the rule during the first of the year, but this condition was not unlooked for in the industry.

While the month of May was not up to the record business of the other months of 1923, it was far ahead of May, 1922, and dealers in the Metropolitan section seem satisfied with the prospects for the future. There is no talk of either a depression or a buyers' strike.

Among the dealers in used machinery, business is normal and with but little change within the past month.

Philadelphia District Has Steady Trade

Summer activity among manufacturers and jobbers in Philadelphia has started off with a minimum of labor troubles. Wages have been at top levels since early Spring, and while in some lines there has been a falling off in orders, generally speaking the situation is reported to be satisfactory.

The demand for used woodworking machinery is about 50 per cent above last year's. However, there has been a falling off in the demand for this class of equipment, which was not unlooked for, in view of the intense demands for the product in the last few months.

Production in the shipyards in the Philadelphia district is better now than at this period of 1922. The marine work has been greatly curtailed, and the yards have turned their attention to general engineering, including the construction of locomotive tenders, railroad cars, paper machinery, and the like.

Only about thirty per cent of the shipyard capacity is now being used for ship construction and repairs. The marine work under way now consists of ferry boats, river passenger ships and floating grain elevators.

Rumors of strikes in some plants have been heard throughout the city, but no definite action has been taken by any of the labor unions, it was stated.

The intense activity at the plant of J. G. Brill & Co., car builders, was reflected in the stock market this week, when the Brill stock rose twelve points in two days to a new high level, 82¾. Reports of increased earnings, with a consequent possible increase in dividends, was generally attributed as the cause of the advance.

Business Poor at European Fairs

Every part of the old world is showing merchandise but there are few buyers—Lyons and Leipzig still the leading expositions—American exhibitors at foreign exhibits

By OUR LONDON CORRESPONDENT

As a result of the war the sentiment of nationality was greatly intensified in a number of the countries of Europe, and as one outcome of this a series of commercial fairs or exhibitions have from year to year been organized, mainly for the purpose of displaying goods produced in the area concerned.

Some of these fairs are, legitimately or otherwise, claimed to be merely the successors of an earlier series; others are frankly newcomers. The exhibitions that were held during the boom period following the armistice could almost certainly be claimed to have justified their existence, but fairs held in the more recent European conditions have demonstrated chiefly the fact that exhibitions are no more successful than other attempts to revivify dead horses by flogging.

In fact among continental engineers there are some who hold that before many years are out only two of these shows will remain, namely the Leipzig Fair which, although this year at best only relatively successful, has through a long history justified its existence, and the Lyons Fair, which will be maintained if only as a demonstration against the hereditary enemy. In Great Britain we have had a series organized under the auspices of the Board of Trade and at one time held simultaneously in London, Birmingham and Glasgow, with exhibits as suitable as possible to each locality. Now only the two English collections remain.

Many Expositions

Recently on the continent fairs were held practically simultaneously in Belgium, Switzerland and Italy and a visitor could proceed through Brussels, to Basle and then to Milan and see the products of the countries concerned. In each case, unlike British practice, the casual visitor could pay for entrance. At Milan, in fact, the larger part of the show was free, a small charge being made to visit the special motor display. Here exhibits were permitted from all nations, including ex-enemies, but in Brussels German goods were not displayed, and the Swiss fair was confined to home products.

The visitor interested specially in machine tools had difficulty in finding anything particularly new, and the display in this direction made three years or so ago at Basle has dwindled down to a very few stands, the most important of which was that of the sheet metal working machines by the Jaecklin branch of the Burckhardt Engineering Co., Basle. Here were bench shears, screw presses and folding and edging, circle-cutting, universal beading, turning and wiring, and combined bending, folding and beading machines. Perhaps the largest tool was a power machine for punching, blanking and forming operations, to exert a pressure of 24 tons. The horizontal milling machine manufactured by La Rigide (H. Levy), Rorschach, was shown in a somewhat improved form, a feature of this machine being that the arm is secured rigidly to the frame by means of an adjustable column to which it is bolted, the column forming an outer support both for the cutter arbor and the knee carrying the table.

Several other machine tool firms were exhibiting, such as Ch. Schäublin-Villeneuve, Malleray, who showed a small lathe and a multiple drilling machine such as needed in the watch and clock trade, and also the firm of Christen & Co., Berne, who showed upright drilling machines.

The Swiss Situation

As elsewhere, the Swiss machine tool industry has had to turn to other fields of engineering endeavor, and chocolate machinery, printing machinery, motorcycles and cycle details may be mentioned, while machine tool repairs and renovations for outside firms are also finding employment, the argument being that although Swiss mechanical engineers, like others, are doubtless able to repair the tools they employ, yet, to take a parallel example, manufacturers of locomotives are probably in the best position to repair or renew locomotives.

In the Milan exhibition most of the tools were of ordinary form, and of them the production of Roberto Züst, Intra, and of the Ansaldi firm of Turin may fairly be compared with those of other countries. At the moment petrol engines for automobiles form a large part of the commercial output.

Returning to the Milan Fair, while the engineering exhibits of the greatest interest were those connected with transport, from electric locomotives to ordinary cycles, wood-working machines and mechanical hammers were prominent. The 2,000th steam locomotive by E. Breda, Milan, was shown: It is of 1,600 hp., for speeds up to 75 miles per hour.

A New Machine for Vertical Milling

Apart from machine tools of ordinary form, a combination tool may be noted, that is, a slotter with an additional head intended for vertical milling. When the machine is milling, the slotting head is swung in a vertical plane so as to lie horizontal; if so required the milling spindle can be speeded up for drilling purposes. Another combination tool was for wood-working including a circular saw of 10-in. diameter, a band saw, a planing machine, a spindle-molding machine, a wood-turning lathe, a drilling machine and a grinding machine, all being combined on a wood frame about 6-ft. long by 3-ft. wide by 7-ft. high, and being driven by a 3 hp. motor placed on top. Then in the automobile hall a new Maag gear generator was exhibited, the machine being of slotter form, with a rack-form cutting tool which simply reciprocates while the blank on a circular table has the necessary motion of rotation and translation, the slotting head being stationary at the top of the stroke when the table returns after about a dozen working strokes.

At Brussels the Belgian machine tool industry was represented by the stands of Jasper, Demoor, Julin, Le Progrès Industrial and Phoenix Nouveau. A new tapping machine by Le Progrès Industrial, Loth, is made in two sizes for holes up to 1 and 2 in. in diameter, respectively. As an indication of output it may be stated that round threads of 8 mm. ($\frac{5}{16}$ in.) pitch by 48 mm. ($1\frac{7}{8}$ in.) diameter by 170 mm. ($6\frac{3}{4}$ in.) long have been produced in 90 sec., while buttress threads of 10 mm. ($\frac{3}{8}$ in.) pitch by 25 mm. (nearly 1 in.) diameter, by 75 mm. (nearly 3 in.) long have taken 22 sec., and square threads of 10 mm. ($\frac{3}{8}$ in.) pitch by 35 mm. (say, $1\frac{3}{8}$ in.) diameter by 100 mm. (nearly 4 in.) long, 100 sec. The taps are milled to give a rake on the cutting edge, with a driving face at the back of each cutting section. Each has a long pilot which engages with the driving chuck before the cutting starts.

Several New Ideas

Then the firm of Karl Julin, Liége, exhibited a backing-off machine of shaper type, the tool being carried on an arm, by means of which it is moved through a circular arc, while the blank is secured on a horizontal mandrel eccentric to the sweep of the cutting tool. A French backing-off machine by the A. F. O. M. E. Co., Bois-Colombes, is specially designed for the production of form milling cutters used in gear-cutting. Two tools are held on a carriage and they work down the sides of the blank according to templet, one on each side, the cutter itself having a cam-produced reciprocating motion for the relief. At this exhibition a considerable number of English high-speed and similar cutting steels were exhibited and a few small tools, but no English machine tools—except in the form of Belgian-produced copies. The largest and most complete stand was that of Henri Benedictus, Brussels, who showed Belgian tools as well as Italian, Swedish, French and other European productions. Displayed mainly under belt were a series of American tools, amongst which the Pratt & Whitney Co., the R. K. Le Blond Machine Tool Co., the Allen Manufacturing Co., and the Pawtucket Manufacturing Co. had exhibits.

The experiences of the Belgian machine tool trade have not been very different from those of other European countries, but not long ago on account of the Ruhr trouble and the difficulty in obtaining supplies from Germany a small boom was noted by home manufacturers, which, however, has now subsided.

Last year, at any rate, few firms made profits and the exchange rate makes the import of American or British tools difficult. Amongst dealers the feeling is that as regards imports the future lies with America for quality and Germany for price, and that to do business British firms must manufacture in Belgium so as to avoid heavy tariffs.

News of Washington Activities

BY PAUL WOOTON

Legislation which would fix certain coal standards is favored in a resolution adopted by weights and measures officials from the various states who met in Washington recently at their annual conference at the Bureau of Standards. The resolution pointed out that there are no definite specifications as to coal quality; that the heat values of the various varieties are unknown and that there is no general knowledge as to the effect upon coal when sheltered or exposed. It was the sense of the meeting that suitable action should be taken by Congress "to the end that an adequate legislative remedy be afforded the people of this Nation by fixing the proper standards." The conference also recommended that the several states adopt as their standards those fixed by Congress or by its authorized agencies.

Another resolution adopted at the conference provides for the use of the net ton as the universal standard in the sale of coal. The fact that Pennsylvania uses one ton for bituminous coal and another ton for anthracite was cited as indicative of the lack of system in handling the principal unit used in the coal trade.

The Joint Board for Jurisdictional Awards in the Building Industry has declined to change its ruling made two years ago awarding metal trim work to the metal workers' union. Because of this ruling, the carpenters' union has declined to recognize the authority of the board, claiming that the ruling was made without a presentation of the case on behalf of the carpenters. The carpenters had obtained several postponements of the hearing and their representative withdrew from the board when the majority decided that no further delay should be granted.

The coal industry in England is in a bad way, in the opinion of John L. Lewis, president of the United Mine Workers of America. The wage being paid mine workers in England, based as it is on the selling price of coal, is insufficient, Mr. Lewis told the President's Coal Commission, to allow the workers to live in other than a state of poverty. Mr. Lewis left the impression with the Commission that the British producers are in no position to increase the price of coal. The situation, however, has been improved somewhat by the increased demand for British coal which has grown out of the occupation of the Ruhr.

Chairman Hammond and Dr. Smith, who represented the Commission at the conference with the press, would give little additional information as to what had been told them by the mine workers' president. They did state positively that there had been no discussion of the anthracite wage scale. One of the points which Mr. Lewis brought to the attention of the Commission, Mr. Hammond revealed, was that of the relative productivity of the average mine worker in America as compared with the average mine worker abroad. Mr. Lewis declared that the American mine worker is several times as efficient as the foreign coal digger. He pointed out, however, that British coal mines are safer places to work in than are the mines in the United States. Mr. Lewis made the point that there must be closer cooperation between operators and their employees looking to the lowering of the accident hazard.

BUSY WITH REPORTS

The Commission now is engaged busily in digesting the important staff reports submitted on June 1. Particular care was taken with these reports as they will furnish the basic information on which the anthracite report will be based. Much attention was given the report of Prof. J. H. Hollander, which deals with the financial aspects of the anthracite situation. In addition to the written report, Professor Hollander and members of his staff discussed the subject matter orally with the members of the Commission.

Specifications and standards to apply to all commodities moving in interstate or foreign commerce will be discussed at a conference to be held at the Department of Commerce on June 11. F. R. Wadleigh is in charge of the arrangements being made for the conference. Mr. Wadleigh is planning the issuance of an encyclopedia of specifications and standards. He believes it is possible to apply to most commodities, the same principle which is working out so well in the simplification of specifications and standards for the commodities purchased by the Government.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.034	$0.34	$0.0236
Cold finished shafting	per lb.	0.042	0.042	0 032
Brass rods	per lb.	0.1850	0.1913	0.1517
Solder (½ and ½)	per lb.	0.2862	0.2987	0.21
Cotton waste	per lb.	0.1231	0.1231	0.104
Washers, cast iron (⅛ in.)	per 100 lb.	4 66	4 66	4.00
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	2.96	2.96	3.11
Lard cutting oil	per gal.	0 608	0.592	0.608
Machine oil	per gal.	0.349	0.349	0.40
Belting, leather, medium	off list	42½%	42%	48½%
Machine bolts up to 1 x 30 in.	off list	44¼%	44¼%	62⅜%

Big Gains Made in April By Railroads

April reports of 48 railroads scattered throughout the United States made public since the first of the last week show a total net operating income of $48,578,956, against $34,664,462 on the same roads in April last year, an increase of almost 41 per cent. These figures are said by railroad authorities to be indicative of the conditions that prevailed in April this year on roads throughout the United States, in comparison with last year.

May Business in Chicago Equals April

Chicago machine tool dealers report that sales during May are about the same in volume and value as during April; March is still the banner month of the year as far as machine tool sales go. Yet the Chicago Federal Reserve Bank reports sales of agricultural machinery and equipment in the United States as being 5 per cent greater during April than in March, according to information furnished it by ninety-eight manufacturers.

Since general manufacturing concerns purchased even less in the machine tool line during the past week the railroads are in the limelight. The Chicago, Burlington & Quincy R.R. has issued a list of eighty-seven machine tools. The Union Pacific and the Santa Fe have issued additional lists. The Santa Fe is reported to have further deferred making purchases of items out on inquiry. The Denver & Rio Grande Western list now contains inquiry for nearly 150 machine tools besides sixteen pieces of wood-working machinery. The New York, Chicago & St. Louis is in the market for fourteen machine tools including lathes, drilling machines, planers, and boring and turning machines. The Pennsylvania R.R. is in the market for lathes and other equipment for its shops at Conway. The Atlantic Coast Line has ordered an 80-ton coach hoist from the Whiting Corp. and the Central R.R. of New Jersey has purchased a 25-ton electric gantry crane from the Milwaukee Electric Crane & Mfg. Company.

The opinion of dealers in the Chicago District seems to be that the March record will not be exceeded this year. It is believed, however, that the reaction this country has experienced recently should be quite helpful. It served to terminate abruptly a serious tendency toward inflation. If we can consider this setback merely for what it is, proceed to do business on a stabilized basis and refuse to listen to the ravens, states one authority, we shall have profited by the experience.

Although a comparatively few orders are being received, cancellations are infrequent and buyers are ordering nothing but equipment that is essential to current needs.

Iron and steel buying is unusually slack in the Chicago district although production holds to the high levels established early in May. Signs of a slackening in the automobile industry are noted, but other lines are still going at a high rate.

Many New Cars Installed By Railroads

The railroads of the United States from May 1 to May 15 this year installed 5,633 new cars and 308 new locomotives, according to reports just filed by the carriers with the Car Service Division of the American Railway Association. This brought the total number of new freight cars up to 55,784 installed since the first of the year.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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THE GOLDEN flood that is inundating the United States is giving great concern to bankers and is a factor with which all business men must ultimately reckon, even though they may be presently unaware of its importance.

The statement of the Federal Reserve System published last Friday shows that the gold supply was increased by over $15,000,000 during the week and that the total now stands at $3,108,762,000. This is $100,000,000 in excess of the amount held at the same time last year and a record in the history of the Federal Reserve System.

In view of our foreign trade figures, which show that for the first four months of the present year our imports have exceeded our exports by $89,000,000 the continued influx of gold is causing surprise among those who have forgotten that Great Britain has agreed to pay about $160,000,000 annually on account of the interest and principal of her debt to the United States and that even if the excess of imports over exports for the second four months of the year should be as large as it was for the first four months the resulting balance would not much exceed the remittances for which the British Treasury must provide.

Therefore those who are haunted by t' fear of gold inflation find themselves confronted with a choice between keeping our present large supply of gold indefinitely or increasing our imports to a degree that might check our own industrial activity.

It is for this reason that Mr. Hoover and some other economists of lesser note have suggested that part of our present redundant gold supply should be "mentally ear marked" and reserved against the time when it may be required for export. But this plan is not likely to be adopted and thoughtful men are beginning to wonder what will happen on this side the Atlantic if Europe persists in using fiat paper money indefinitely and America continues to attract the world's gold production.

It is a serious question and attention was freshly directed to it last week when German marks sold at 14¼ cents for ten thousand, concurrently with the arrival of gold marks worth about $7,500,000 sent here for Belgian account.

It is, however, doubtful whether the reactionary tendency of the markets toward the end of the week was due to a popular appreciation of the importance or implications of the gold problem. It is a recondite subject concerning which even bankers and trained economists are disagreed and the probability is that their doubt and hesitancy rather than any public comprehension of the matter is reflected in the prevailing apathy of enterprise and speculation.

People know that if the potential credit supply were released the markets would bound upward, but they also fear that it may be impounded or arbitrarily put beyond the reach of borrowers who would thereupon be compelled to liquidate.

The result has been dullness, with a tendency toward lower prices despite conditions that are inherently satisfactory in so far as the demand for goods and the employment of labor are concerned.

Railroad earnings for April and car loadings for May are both the largest on record. Bank clearings also indicate an unprecedented turnover of merchandise. But the stock market has been dull and even the railroad shares have responded but sluggishly to the remarkably good returns made public from day to day.

> "No one seems inclined to stock up or make any heavy commitments, and one result of this attitude is an appearance of dullness at which those who crave excitement and activity are impatient. But it is not to be denied that another result is the comparatlve stability advocated by economists and that while the intoxication of a boom is lacking, there is but little danger of a panic in the prevailing sobriety."

The bond market is quieter, but steady, showing the tonic effect of the preparations that are being made to insure the success of the Austrian loan for which a large oversubscription seems probable.

The demand for steel indicates a slight lessening in the eagerness to buy. Copper is down to 14¼ cents. Wheat is somewhat easier. So is corn. Sugar is slightly lower, and cotton is off nearly a cent a pound from the top on a Government report of 71, which was about 2 points better than the majority of the trade had expected.

The lack of aggressiveness thus reflected in the markets commonly called speculative was also noticeable in the distributive trade. Hand to mouth buying is the rule. No one seems inclined to stock up or make any heavy commitments, and one result of this attitude is an appearance of dullness at which those who crave excitement and activity are impatient.

But it is not to be denied that another result is the comparative stability advocated by the economists and that while the intoxication of a boom is lacking there is but little danger of a panic in the prevailing sobriety.

In Europe the outlook is as enigmatical as ever and it cannot be said that the week's developments have in any way clarified it. The statesmen of Europe seem to be resigned to the indefinite occupation of Germany by France and the possible disintegration of the German Republic as a consequence of the economic disintegration now in progress.

In such an event France could hardly hope to collect any substantial portion of the reparations claimed, but there are many who believe that she would consider her safety from the German menace cheaply bought by the surrender of her monetary claims.

The situation in China is also commencing to be viewed with some apprehension in the Occident, and there are many who are coming to fear that the utter supineness of the Chinese government will compel the benevolent intervention of the Western powers. But both France and China are far away from Wall St. and the Mississippi Valley, and business in America will be but little affected by developments overseas if the apprehension of the Golden Flood attracted hither by our opulence is relieved through the adoption of a definite policy for its control and use.

Locomotives Are in Good Condition

The railroads of the United States on May 15 not only had more serviceable locomotives than ever before since the Car Service Division began the compilation of its locomotive records in August, 1920, but there were also fewer locomotives in need of repair than ever before during the same period.

Serviceable locomotives on May 15 totaled 50,587, an increase of 328 over the total number on May 1 this year, which had previously marked the peak.

Locomotives in need of repair on May 15 totaled 13,495 or 21 per cent of the number on line. Compared with the number on May 1, this was a decrease of 636 locomotives.

Locomotives awaiting heavy repair totaled 12,183 or 19 per cent of the number on line, compared with 12,473 or 19.4 per cent on May 1, or a difference of 290 locomotives. Under the program unanimously adopted at a meeting of the railroads in April in New York, the number of locomotives awaiting heavy repair are to be reduced by October 1 next to 15 per cent.

Reports also showed 1,312, or 2 per cent of the total number on line, to be in need of light repair on May 15. This was a decrease of 346 since the first of May.

During the semi-monthly period from May 1 to May 15, a total of 16,904 locomotives were repaired and turned out of the shops. This was an increase of 485 over the number repaired during the last half of April.

Two Roads Report Large Gains for April

The Pennsylvania R.R. system, in its monthly report, shows a net operating income for April of $8,019,444, an increase of $2,185,897, or more than 33⅓ per cent over April last year. The net operating income for the first four months of 1923 is $25,085,365, a decrease of $4,294,480, as compared to the same period of 1922.

Gross revenue for April was $64,833,984. Of this amount the greatest increase was reported in the freight revenue, which totaled $44,361,991. At the same time there was an increase of more than 20 per cent in the operating expenses, amounting to $9,376,530, bringing the total operating expenses for April to $52,498,054.

A report of the Canadian National Railways for April, made public recently, shows a net income after expenses, of $2,221,674, against a deficit of $974,866 in the same period last year. This decreases the deficit after taxes for the first four months of this year to $1,309,643, against a deficit at the same time last year of $3,894,675.

Gross income for April was $21,056,312, making the total gross income for the first four months of this year, $75,719,484, which indicates excellent business for the road.

Midwest Coal Production Nears Record

Although there is little indication of any wide-spread movement to store up coal, bituminous production in April reached 42,000,000 tons, the largest April tonnage in recent years except 1918, according to the May business conditions report of the Federal Reserve Bank of Chicago.

Spot prices declined nearly 10 per cent during April.

In Illinois and Indiana high cost of production and low spot prices, with a continued lack of market, have resulted in closing of additional mines, the report said. In Indiana, it added, mines operating during April averaged only 38.8 per cent of full time.

Markham Optimistic as to Railroad Future

C. H. Markham, president of the Illinois Central R.R., expressed his optimism in the future of the railroad industry in a letter addressed to stockholders.

"The treatment which the railroads have received at the hands of the legislative bodies is responsive to public sentiment," he said. "Measures inimical to the welfare of the railroads doubtless will be introduced in the sixty-eighth Congress when it convenes a few months hence. An effort will be made to repeal or amend the Transportation act of 1920. It is not perfect. I believe it should stand in its present form until such time as judgment of its matured and proper experience is had upon which to base any needful changes in it. Existing rates, higher than the prewar level, are sometimes blamed on the Transportation act. Unless there is a comparable reduction in cost of performing transportation service, rates cannot be reduced.

"I forsee no serious danger for the railroads, for I have faith in the soundness of public opinion and believe it will not go far astray when properly informed. Our duty is to make sure it is properly informed."

Obituary

WILLARD T. SEARS, research and experimental engineer of the Niles-Bement-Pond Co., died recently at Montclair, N. J. Mr. Sears had been with the company for over twenty years. Prior to this he was connected with the Pennsylvania Steel Co. for a number of years. He was a member of the class of 1887 of Massachusetts Institute of Technology. Mr. Sears was an inventor of exceptional imagination and the machine tool industry has greatly benefited from the many developments which he originated.

GEORGE A. RENTSCHLER, president of the Hooven, Owens & Rentschler Co., Hamilton, Ohio, manufacturer of the Hamilton-Corliss engine and sugar mill equipment, is dead. Mr. Rentschler was also president of the Hamilton Foundry & Machine Co., and vice-president of the Phoenix Castor Co. He was one of the most widely known business men in the Middle West.

JAY B. SUCESE, ex-general superintendent of the Monon railroad, who had lived in Indianapolis for the last twelve years, died recently at his home. Mr. Sucese was 72 years old.

DR. RUDOLPH HERING, well-known sanitary engineer, died recently at his home in New York City. Dr. Hering was formerly a member of the firm of Hering & Fuller, consulting engineers to the New York Department of Water Supply, Gas and Electricity and to the sewerage and water boards of New Orleans, Columbus, Ohio, and other cities.

Personals

HENRY DRESES, formerly president and general manager of the Dreses Machine Tool Co., Cincinnati, Ohio, who recently retired from active business, sailed recently on the "Reliance" for Bremen, Germany.

W. S. CASSIDY, shop foreman of the Logansport, Ind., division of the Pennsylvania R.R., was an honored guest at a banquet recently served to officers of the division and fellow workmen. The foreman was honored for his fifty years' service with the company. Cassidy entered the employ of the railroad at the age of fourteen.

H. R. SARGENT, formerly manager of the wiring supplies division of the Bridgeport Works of the General Electric Co., has been appointed managing engineer of this division under a development plan which will create several unit divisions at the Bridgeport factory.

H. R. N. JOHNSON, who formerly represented the Uehling Instrument Co., Paterson, N. J., in Minnesota and the Dakotas has joined the W. P. Nevins Co., Minneapolis, Minn., that represents the Uehling Instrument Co. in that territory now.

JOHN A. MACDOWELL, Railway Exchange Building, St. Louis, Mo., will be the representative of the Uehling Instrument Co., Paterson, N. J., for eastern Missouri.

C. H. LONG, formerly manager of the contract section of the railway department of the Westinghouse Electric & Manufacturing Co., East Pittsburgh Pa., has been appointed a section manager of the light traction division of the railway department.

W. P. JEND has been appointed manager of the merchandising division of the Westinghouse Electric & Manufacturing Co. in Detroit, Mich., to succeed F. D. KOELBEL who will take up general duties in connection with both the central station division and the merchandising division.

EARL W. CANNELL, who has been with the Osborn Manufacturing Co. for the past 17 years, has been made purchasing agent, effective June 1, 1923. He will be in the Cleveland office. W. E. MITCHELL, who has been purchasing agent for the past eight years, has resigned to go into business.

W. W. ATTERBURY, vice-president in charge of operation of the Pennsylvania Railroad Co., sailed Saturday on the Olympic for several weeks in Europe.

L. I. SHAW, assistant chief chemist of the Bureau of Mines, on June 6 will deliver the dedication address at the new chemical building of Alfred University and of the New York State School of Ceramics.

L. M. DALTON has succeeded E. J. BURNELL as manager of the Boston branch office of the Link-Belt Co., Chicago. Mr. Burnell resigned to enter business for himself.

E. J. CLEAVE, formerly connected with the Pennsylvania R.R. has been appointed district manager in New York for the Car Service Division of the American Railway Association. He assumed his duties on June 1 and is located at 30 Vesey Street.

WILLIAM H. KILPATRICK, formerly manager of the manufacturing of the Willys-Overland Co. at Elmira, N. Y., has recently been promoted to the position of assistant to the president, John N. Willys.

T. E. SIMPERS, formerly manager of the general mill section of the industrial department of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has been appointed export representative of the industrial department.

L. A. CARTER, president of the Lehman Machine Co., St. Louis, recently returned from a trip through Texas.

Business Items

The Cleveland office of the Link-Belt Co. has been changed from room 429 to room 329 Rockefeller Building.

The Pennsylvania Crusher Co., Philadelphia, has moved its offices in Pittsburgh from the Peoples' Bank Building to the Oliver Building. H. M. Mallett is the district manager.

The Aetna Ball Bearing Manufacturing Co., Chicago, is now located at 2737-2745 High Street.

A plant for the manufacture of a patented rapid motion rotary saw and baby guard has just been established in New Orleans, La. It is called the Bionville Manufacturing Co., and is located at 508 Magazine St. It manufactures all kinds of wire net work and is said to be the only factory of its kind south of Cincinnati. Edward Michel is president, Gabe Correjellos vice president and J. Arnoult, secretary and treasurer.

Property of the Indiana Silo & Tractor Co., of Anderson, Ind., was restored to the control of the company May 24, by an order of W. A. Kittinger, judge of the Madison circuit court, after the Anderson Trust Co., as receiver, had filed a final report, which the court approved.

Two car loads of glass blowing machinery for a factory owned by Stinnes, the German manufacturer, have been ordered from the Dice Machine Co., at Anderson, Ind. The Lynch glass blowing machines will be shipped to the Germany factory in a few weeks. Two car loads of glass blowing machinery also have been ordered by an Australian company. The plant is operating at full capacity with a full force of employees.

Steps are being taken toward the reorganization of the Holmes Automobile Co., Canton, Ohio, manufacturer of the Holmes air cooled car, following the sales of the company recently to the bondholders of the company, according to Clarence Herbruck, counsel for the bondholders. After a hearing before the referee in bankruptcy, Attorney Celsus Pomerene, the holders of the outstanding bonds took over the plant with the purpose of effecting a reorganization and resuming operations.

An invitation for proposals to furnish, among other things, tool steel, bronze bars, drilling machines and armoured cable has been sent out by the office of the General Purchasing Officer, Washington, D. C. The materials are for use at the Panama Canal and the sealed proposals in triplicate will be received at the office of the General Purchasing Officer of the Panama Canal not later than 10: 30 o'clock on June 18. Full particulars may be obtained by writing to the office at Washington.

The Triplex Machine Tool Corp., New York, has appointed the Andrews & George Co., Tokio, Japan, its exclusive sales representative for Japan and Manchuria for the Triplex combination bench lathe, milling and drilling machine.

Uehling Instrument Co., Paterson, N. J., has appointed the Amsler-Morton Co., Fulton Building, Pittsburgh, Pa., its representative for western Pennsylvania.

Fire of undetermined origin destroyed the main plant of the Warren Steel Casting Co., 3400 Maury Ave., St. Louis, Mo., recently with a loss of $100,000, according to estimates.

The St. Louis Brass Mfg. Co., St. Louis, Mo., has changed its name to the Edwin F. Guth Co. and has filed application to increase its capital stock from $50,000 to $500,000. Edwin F. Guth is president.

Owing to a recent fire at the South Sudbury, Mass., plant of the Hurlbut, Rogers Machinery Co., all work is being done at Nashua, N. H., where the company will be permanently located.

Milwaukee Still Busy With Back Orders

Machine tool production in Milwaukee is being maintained at the same high level that was reached early in March on the basis of business that was placed since last Fall which required a spread of delivery dates over a period as far forward as July 1 of this year. Authentic reports made by the Allis-Chalmers Manufacturing Co., probably the largest industry in Milwaukee, show that orders are coming in at a fair rate in all departments, but orders on the books require more capacity than has been in use and additional help is being sought to handle the large increase in business accumulated during the first four months of the present prosperous year.

Business in general is not as lively as it was during the first part of 1923, but the let-down was not unexpected nor unprepared for. Workers are being kept busy in most shops and executives are devising means of keeping the present rate of production up through the summer months. Even with a slowing down in the sales department, business is much improved over last year and indications are that the fall will be an exceptional season.

There has been a tendency, according to Milwaukee machine men, for purchasers to order from several sources, cancelling all orders except the first delivered. As this was one of the causes of the depression of 1920, every effort is being made to curb the practice before it becomes a menace to the business conditions today.

Machinery Exports for April Gain

Exports of metal-working machinery during April, 1923, with revised comparative figures for April, 1922, as compiled from the returns to the Department of Commerce, were as follows:

EXPORTS METAL-WORKING MACHINERY

	April, 1922 Value	April, 1923 Value
Lathes	$45,608	$66,001
Boring and drilling machines	25,280	107,432
Planers, shapers and slotters	25,685	20,554
Bending and power presses	644	4,142
Gear cutters	2,091	9,724
Milling machines	17,591	26,320
Thread cutting and screw machines	13,178	27,362
Punching and shearing machines	8,700	10,235
Power hammers	5,673	8,168
Rolling machines	221	1,096
Sharpening and grinding machines	67,804	69,678
Chucks, centering, lathe, drill and other	10,015	25,800
Reamers, cutters, drills and other parts of machine tools	122,851	200,619
Pneumatic portable tools	17,919	58,906
Foundry and molding mach'ry	35,834	37,594
Other metal-working machinery and parts of	385,716	343,170
Total metal-working mach'ry	$784,900	$1,016,801

Freight Loading Near Record Figure

Breaking all previous car loading records for this season of the year, as well as any previous record this year, the railroads handled a total of 991,797 cars of revenue freight during the week ended May 19, according to the American Railway Association. This was an increase of 17,266 cars over the preceding week's figures.

The total for the week ended May 19 exceeded the loading figures for the corresponding week in 1922 by 210,844 cars and the corresponding week in 1921 by 220,806 cars. It was only 2½ per cent below the record week in history, established October 14, 1920, when a total of 1,018,539 cars were moved.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

General engineers requisites, machine tools and blacksmith power tools. Christchurch, New Zealand. Purchase and agency. Reference No. 6528.

Equipment for foundries, shipyards and machine shops. Copenhagen Denmark. Agency. Reference No. 6561.

Oval-head countersunk screws, 1,000 lb. and disk washers to fit screws, 1,000 lb. Halifax, Canada. Purchase. Blueprints were forwarded and may be examined at the bureau or its district offices. Reference No. 6562.

Can-making machinery, packing machinery. Calcutta, India. Purchase. Reference No. 6587.

Machines for the manufacture of wire, nails and the like. Antofagasta, Chile. Purchase. Reference No. 6588.

Road-making machinery, dump trucks, road rollers, rock crushers power shovels, etc. Grand Falls, Newfoundland. Purchase. Reference No. 6589.

Cement mixers. Barcelona, Spain. Purchase. Reference No. 6590.

Air turbines made for the pressure of 100 lb. for driving tools of different kinds. Christiania, Norway. Purchase. Reference No. 6591.

Lathes for wood turning and tools for woodworking. Goteborg, Sweden. Agency. Reference No. 6592.

A 45-meter sawband, gage, die No. 43. Rio de Janeiro, Brazil. Purchase. Reference No. 6593.

Gasoline woodworking machinery, machine tools, special steel for aviation and automobiles. Madrid, Spain. Purchase. Reference No. 6594.

Forthcoming Meetings

Taylor Society. Meeting at the Hotel Onondaga, Syracuse, N. Y. June 7, 8 and 9.

American Society for Steel Treating. Eastern sectional meeting, Bethlehem, Pa., June 14 and 15. Hotel reservations through George C. Lilly, Superintendent of Heat Treatment, Bethlehem Steel Co., Bethlehem, Pa.

American Society for Testing Materials. Annual meeting at Atlantic City, June 25 to 29, Chalfonte-Haddon Hall. C. L. Warwick, 1315 Spruce St., Philadelphia, is secretary.

Society of Automotive Engineers. Summer Meeting. Spring Lake, N. J., June 19 to 23.

Section V Mechanical of the American Railway Association. Annual meeting at Orchestra Hall, Chicago, June 20, 21 and 22. V. R. Hawthorne, 431 South Dearborn St., Chicago, secretary.

Association of Iron and Steel Electrical Engineers. Iron and steel exposition, Buffalo, Sept. 24 to 28. John F. Kelly, secretary, Association of Iron & Steel Electrical Engineers, 708 Empire Building, Pittsburgh, Pa.

New Haven Branch of the American Society of Mechanical Engineers. Third annual machine tool exhibit during the month of September. New Haven, Conn.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Steel—Slight improvement in steel buying during week. Demand principally for oil storage tank plates and car material. The minimum on steel plates remains at $2.50 per 100 lb., Pittsburgh, with some contract tonnages quoted at $2.55@$2.60. Price trend in steel plates has taken an upward turn. Structurals also firmer; demand somewhat restricted owing to postponement of many new building projects. Steel bars firmer; buying still at $2.40@$2.50 per 100 lb., f.o.b. mill.

Advances—Both antimony and tin advanced ¼c. per lb. in New York during week. Higher rates on gray iron machinery castings reported in Detroit. Slight upward trend in coke plates in New York warehouses. Improved tone in lard oil market; price now 65c. as against 60c. per gal., one week ago, for oil, 25 per cent lard.

Declines—Copper market regarded as having reached bottom; price down ¼c. per lb. in week. Zinc declined ¼c. per lb. Lead tending downward. Copper sheets reduced 1c. per lb. in New York warehouses, during week.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$31.55
Northern Basic	32.27
Southern Ohio No. 2	33.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	34.94
BIRMINGHAM	
No 2 Foundry	27.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	32.64
Virginia No. 2	35.17
Basic	31.50
Grey Forge	30.00
CHICAGO	
No. 2 Foundry local	33.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	33.01
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	31.00
Basic	31.00
Bessemer	31.00

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.50
Cleveland	5.60@6.25
Cincinnati	6.75
New York	5.50@5.75
Chicago	4 00@5.00

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	3.00@3.35	4.59	3.90	4.15
No. 12	3.10@3.45	4.64	3.95	4.20
No. 14	3.20@3.55	4.69	4.00	4.25
No. 16	3.40@3.75	4.79	4.10	4.35
Black				
Nos. 17 and 21.	3.70@4.10	4 95	4.55	4.85
Nos. 22 and 24.	3.75@4.15	5.00	4.60	4.85
Nos. 25 and 26.	3.80@4.20	5 05	4.65	4.90
No. 28	3.85@4.25	5.15	4.75	5.00

Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11.	4.00@4.50	5.15	4.80	5 10
Nos. 12 and 14.	4.10@4.60	5.25	4.90	5.20
Nos. 17 and 21.	4.40@4.90	5.55	5.20	....
Nos. 22 and 24.	4.55@5.05	5.70	5.35	5.65
No. 26	4.70@5.20	5.85	5.60	5.80
No. 28	5.00@5 50	6.15	5.90	6.10

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	62	50½	¾ to 1½	30	13
		LAP WELD			
2	55	43½	2	23	7
2½ to 6	59	47½	2½ to 4	26	11
7 and 8	56	43½	4½ to 6	28	13
9 and 10	54	41½	7 to 12	26	11
11 and 12	53	40½			
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	60	49½	¾ to 1½	30	14
2 to 3	61	50½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	53	42½	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 and 8	52	39½	7 and 8	21	7
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	48%	34%	55½%	43½%	62½%	48½%
2½ to 6 in. steel lap welded	44%	30%	53½%	40½%	59½%	45½%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 15%. Cast iron, standard sizes, 17½% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	5.00	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	7.50@8.00	8.00	7.35
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.25
Floor plates	5.80	5.66	5.80
Cold finished shafting or screw	4.40	3.90	4.30
Cold finished flats, squares	4.90	4.40	4.80
Structural shapes (base)	3.64	3.46	3.40
Soft steel bars (base)	3.54	3.36	3.32½
Soft steel bar shapes (base)	3.54	3.36	3.32½
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.71	3.40
Bar iron (3.25 at mill)	3.54	3.36	3.32½
Carbon tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%
Electric welding wire:			
3/32	8.50		14.00
⅛	7.35		12.25
5/32 to ¼	7.10		11 00

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			15.625
Tin, 5-ton lots, New York			43.625
Lead (up to carlots), St. Louis	7.05;	New York.	7.72½
Zinc (up to carlots), St. Louis	6.35;	New York.	6.85

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	26.20	30.00	28.50
Antimony (Chinese), ton spot	8.25	10.50	8.75
Copper sheets, base	25.50	24.25	23.00
Copper wire (l.c.l.)	18.12½	21.00	16.25
Copper bars (l.c.l.)	22.50	24.25	19.50
Copper tubing (l.c.l.)	27.00	29.25	23.00
Brass sheets (l.c.l.)	20.50	24 25	18.75
Brass tubing (l.c.l.)	25.50	29.75	20.50

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Brass rods (l. c. l.)	18.75	21.00	15.75
Brass wire (l. c. l.)	21.00	22.00	.....
Zinc sheets (casks)	11.00	10 40	.....
Solder (½ and ½), (caselots)	31.50@33.50	29.50@31.50	20.00
Babbitt metal (83% tin)	60.00	53 00	41.00
Babbitt metal (35% tin)	35.00	17.50	18.00
Nickel (ingot and shot), Bayonne, N. J.	29.00	.....	35 00
Nickel (electrolytic), Bayonne, N. J.	32.00	.....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	55
Hot rolled rods, Grade "A" (base)	50
Cold drawn rods, Grade "A" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled rods "E"—low manganese (base)	54
Manganese nickel hot rolled rods "D"—high manganese (base)	57

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	46.00
Hot rolled sheets (base)			45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	13.50@14.00	13.00	14 00
Copper, heavy, and wire	13.25@13.75	12.00	13 00
Copper, light, and bottoms	11.25@11.75	10.50	12.00
Lead, heavy	5.00@ 5.50	4 00	6 25
Lead, tea	4.50@ 4.75	4.00	5.25
Brass, heavy, yellow	7.50@ 7.75	....	8.50
Brass, heavy, red	11.00@11.50	10.50	10.50
Brass, light	6.00@ 6.50	5.50	7 00
No. 1 yellow brass turnings	7.50@ 7.75	7 00	7 75
Zinc	3.75@ 4.25	3.50	4 25

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	23.50	19.50	18.50
IX,	20x28, 112 sheets	26.00	22.25	20.90
"A" Grade:				
IC,	20x28, 112 sheets	21.00	17.00	17.00
IX,	20x28, 112 sheets	23.50	19.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	14 00	12.60	14.50
IC,	112 sheets	14 30	13.00	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	8.00	6.65	7.25
IC,	14x20	8.25	6.55	7 40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.11½
Cotton waste, colored, per lb.	.08@.13	.12	.08
Wiping cloths, 13¼x13½, per lb.	11.25	36.00 per M	.10
Wiping cloths, 13¼x20½, per lb.	....	52.00 per M	.13
Sal soda, per 100 lb.	1.65	3.50	2.65
Roll sulphur, per 100 lb.	2.60	3.25	3.50
Linseed oil, per gal., 5 bbl. lots.	1.16	1.30	1.37
White lead, dry or in oil	100 lb. kegs.	New York, 14.50	
Red lead, dry	100 lb. kegs.	New York, 14 50	
Red lead, in oil	100 lb. kegs.	New York, 16.00	
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton	$4.50@6.00	
Coke, prompt foundry, Connellsville	per net ton	6.00@7.00	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	30%	50-10%	45-5%
1½ and 1¼x3 in. up to 12 in.	15%	50%	5 %
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	15%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	20%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65-5%
Lag screws, coach screws	30%	.....	60-5%
Square and hex. head cap screws	60%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	25%	45%	40-5%
Bolt ends, with hot pressed nuts	30%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, ⅞ and smaller	60%	.....	...
Semi-finished nuts, ⅝ and larger	55%	65-10%	80%
Case-hardened nuts	40%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, ⅜ in., per 100 lb. (net)	5.50	4.00	3 50
Washers, round plate, per 100 lb. Off list	1.50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, hex., per 100 lb. Off list	List net	2.75	2.50
Rivets:			
Rivets, ⅞ in. dia. and smaller	40%	50-10%	50%
Rivets, tinned	40%	50-10%	4½c. net
Button heads ⅜-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.50	$3.90	$3.75
Cone heads, ditto (net)	5.60	4.00	3.85
1½ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb.	0 25	.....	0.15
⅝ in. diameter *EXTRA*	0 15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base

Lard cutting oil (50 gal. bbl.) per gal.	$0.65	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls). Leather—List price, New York, per ply, 12-in. wide, per lin.ft., $2.88:			
Medium grade	30–10%	40½%	50%
Heavy grade	20–5–2½%	30–5%	40–5%
Rubber and duck:			
First grade	50–10–5%	50–10%	40-10%
Second grade	60–10%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.84	$5.84	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.50	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.32	1.24	1.40
Cloth	3.02	2.67	3.20

New and Enlarged Shops

Machine Tools Wanted

Ala., Attalla — Alabama Co. — machine shop, forge shop and hoisting equipment, also mining machinery.

Calif., Reedley — Reedley Joint High School Dist., E. W. Hauck, principal—receiving bids until June 11 for machinery and equipment to teach automechanics and machine shop practice.

D. C., Wash. — Navy Dept. — receiving bids until June 12 for three heavy engine lathes, 16 in. x 6 ft., bed, geared head, screw cutting, quick change gear, motor driven with set of spares for motor and controller, for delivery at Mare Island, Calif.

Ga., Athens—Athens Machine Shop, Box 662—drill press, lathe, etc.

Kan., Caldwell — J. Bagley (machine shop)—power lathe and cylinder grinder (used).

Kan., Caldwell—C. Foster, 523 Webb St. (machinist) — large platform power drill press.

Kan., Caldwell—W. G. and G. Vaughn, 108 East Central Ave.—power drill press and power lathe.

Kan., Wellington—V. C. Harris, 321 East Lincoln St. (sheet metal)—tinners brake and tools (used).

Kan., Wichita—Bridgeport Machine Co., North Wichita (manufacturer of under reamers)—two lathes, 24 in. x 12 ft. and 24 in. x 16 ft.; one 36 to 42 in. boring mill; 3 phase, 60 cycle, 220 volt attached motors.

La., New Orleans — Bishop Edell Machine Wks., 436 Gired St.—18 in. lathes, 50 ton hydraulic press, one Universal grinder for crank shaft, etc. (used).

Md., Hagerstown—M. Adelman—pipe cutting and threading machine for ⅛ in. up to 12 in., drill press, hack saw and riveting machine.

Mass., Boston—New Method Die Co., 100 Sudbury St.—one multiple Portland punch press; one machine with rollers that can be used for pressing stock; several iron flat top tables; work benches.

Mass., Cambridge—A. F. Robinson Boiler Wks., Inc., 1st St., E., F. B. Wheeler, Purch. Agt.—machine tools for boiler shop.

Mass., New Bedford—New Bedford Gas & Edison Light Co., Purchase St.—machinery for garage and repair shop, including small tools, lathes, drills and planers.

Mich., Marquette—A. F. Libershall (automobile repairs, etc.)—small drill press, air tank, gasoline storage tank and pump.

Mo., Kansas City—J. L. Walter—complete outfit of machinist tools and hand tools.

N. J., Newark—Riverside Steel Castings Co., Plank Rd. and Passaic River (open hearth steel castings), address Purch. Dept.—spoon cutter for steel castings.

N. Y., Binghamton—McManus & Buckley, Henry St.—lathe and drill press for garage repair work.

N. Y., Buffalo—Buffalo Bldg. Co., 1001 Mutual Life Bldg.—vulcanizing and automobile repair equipment for garage at 2260 Bailey Ave.

N. Y., Buffalo—G. A. Kayser, 95 Beard Ave.—garage and repair shop machinery, tools and equipment.

N. Y., Buffalo—A. Messner, 420 Bway—equipment for garage and automobile repair shop on Bway and Pratt St.

N. Y., Rochester—R. J. Cooper, 354 Lexington Ave.—15 in. drill press.

N. Y., Rochester—Mayer Coating Machine Co., 205 St. Paul St.—machine works equipment and machinery, to replace that which was destroyed by fire.

N. Y., Rochester—D. C. McEvoy, 609 Lake Ave.—gasoline and service station machinery, tools and equipment.

N. Y., Saratoga Springs—Baker Mfg. Co.—machine shop and foundry equipment.

N. Y., Silver Creek—C. G. Hammond—machinery and equipment for the manufacture of auto parts for 12,000 sq.ft. of floor space at Dunkirk.

N. Y., Waterloo—C. W. Reeder Co., Virginia St. (garage)—bench miller.

N. Y., Wolcott—Tillapaugh Garage, Salisbury & Kaelin Co., owners, Lake Ave., R. Kaelin, Purch. Agt.—engine lathe for motor repairs (new or used).

O., Cleveland—New York, Chicago & St. Louis R.R. Co., Columbia Bldg., W. P. Dittoe, Purch. Agt.—one pipe threading machine and one 20 in. x 14 ft. lathe.

O., Columbus—Chase Fdry. & Mfg. Co., South Parsons Ave., S. M. Chase, Secy.—one screw machine and one boring machine.

O., Ravenna—Byers Machine Co.—additional machinery to increase capacity of factory for the manufacture of cranes.

O., Xenia — Strawn Press Co., E. E. Strawn, Mgr.—machinery for the manufacture of printing presses and equipment.

Okla., Medford — Scoutens Garage, 100 Main St., J. E. Scouten, Purch. Agt.—power cylinder grinder.

Okla., Medford — Stewart Bros. (hardware)—power lathe.

Pa., Allentown—International Motor Co.—lathes, presses, welders, drills, etc., for proposed $50,000 machine shop.

Pa., Phila.—C. Fey, 64 North Milnick St.—small power driven lathe.

Pa., Phila.—Phila. Badge Co., 942 Market St. (metal specialties)—lathe, 5 or 6 ft. bed, 12 in. swing.

Pa., Smethport—Smethport Garage Co.—lathe, drill press and grinding machine.

Pa., Warren—F. M. Spangler, 307 3rd Ave.—battery charging and service station equipment.

Tex., Dallas—The Contractor, P. O. Box 1094—steam hammer for driving concrete piles.

Tex., Dallas—H. W. Mayhew, 1913 Forest Ave. (machine shop)—24 or 30 in. engine lathe.

Tex., Fort Worth—Texas Steel Co., South Hemphill St., J. E. Foster, Mgr.—tools, electric furnaces, etc., for steel rolling mill.

Tex., Galveston—Office of United States Engineer, L. M. Adams, Dist. Engr.—receiving bids until June 25 for a motor driven screw cutting 24 in. x 10 ft. lathe.

Va., Ashland—Ashland Garage, J. Priddy, Purch. Agt.—lathe and burning-in machine.

Va., City Point—Wilson-Hock Co. (machinery dealers), N. Wilson, Mgr.—16 in. shaper, 24 in. planer, 48 in. x 6 ft. lathe with all attachments, No. 2 Brown & Sharp Universal milling machine, Universal tool grinder, upright drill press, horizontal boring machine, also 2½ in. flanged steam separator for 125 lb. pressure.

Wis., Janesville—Townsend Mfg. Co., R. Townsend, Mgr.—machinery, equipment and small tools for the manufacture of farm tools and implements.

Wis., Kiel—Kiel Machine Co.—equipment, belting, shafting and small tools for proposed machine shop.

Wis., Strum—J. Maloney—automobile repair machinery, press, belting, gasoline tanks and pumps for proposed $40,000 garage.

Alta., Calgary—Totem Mfg. Co. Ltd., 310 1st St., E.—additional equipment for building bus bodies, also for carriage and automobile repair work.

Ont., Ottawa—Campbell Motor Sales Co., 154 Bank St., D. R. Campbell, 196 James St., Purch. Agt.—additional equipment for automobile repairs.

Ont., Ottawa — Campbell Steel & Iron Wks., 855 Carling Ave., H. G. Campbell, 464 Laurier St., Purch. Agt.—additional machinery.

Que., Joliette—Garage Central, Ltd., 12 De Launaudiere St., J. A. Foisy, Purch. Agt.—repair equipment.

Que., L'Assomption—P. Asselin—equipment for garage and automobile repair shop.

Que., Montreal—Comtois & Boutin, 238½ St. Antoine St., A. Comtois, Purch. Agt.—complete equipment for automobile repair shop and garage.

Que., Montreal—Harbor Comrs. of Montreal, M. P. Fennell, Genl. Mgr.—complete equipment for machine and blacksmith shop, to replace that which was destroyed by fire.

Que., Montreal—A. F. Lehman, 411 Aqueduct St.—equipment for automobile repairs.

Que., Ste. Anne de la Perade—E. Paquet—equipment for automobile and carriage repairs.

Que., Ste. Jacques—Forest & Venne, Ltd., A. Venne, Purch. Agt.—small lathe and other equipment for garage.

Machinery Wanted

Ark., Fort Smith—Fort Smith Fertilizer Co.—grinding, drying, mixing and crushing machinery.

Calif., Los Angeles—H. P. Zumwalt & Co., Consolidated Bldg—80,000 bbl. oil tank, oil pump, belting, pulleys and oil pipe.

Calif., San Jose—County of Santa Clara, H. A. Pfister, Clk. of Bd. of Supervisors—refrigerating and ice making plant for county hospital.

D. C., Wash.—A. L. Flint, Genl. Purch. Officer of the Panama Canal—receiving bids until June 18 for bronze bars, tool steel, steel welding wire, copper ribbon, armored cable, bolts, drills and monkey wrenches.

Ga., East Paint — Bd. Educ. — complete vocational equipment for $90,000 school.

Ga., Macon—Standard Handle Co., Division St.—machinery and equipment for proposed $50,000 branch plant for the manufacture of wood implement handles, at Greenwood, Miss.

Ill., Chicago — Hotel Hayes Laundry, 64th St. and University Ave.—dry tumbler and washer.

Ill., Chicago—Ravenswood Press, 4610 Ravenswood Ave.—2 revolution press for newspaper work.

Ind., Anderson—Boland & Hoard Ice Cream Co.—additional refrigerating equipment.

Ind., Carthage — Bd. Educ. — vocational equiment for $90,000 school.

Ind., Deedsville — Bd. Educ. — complete vocational equipment.

Kan., Baxter Springs—Chanute Spelter Co., Hartley Mine Office (zinc mine operators), A. Hartley, Purch. Agt.—drill rig.

Kan., Caldwell—Daily Messenger, A. H. Hammon, proprietor—power job press with Miller feeder (used).

Kan., Caldwell—A. C. Fisher (job printer)—power paper cutter.

Kan., Halstead — Halstead Independent, Main St., E. J. Bookwalter, Purch. Agt.—linotype and job printing press.

Kan., Wellington—J. H. Mitchell & Son (general contractors)—wood saw, Universal power saw preferred.

Kan., Wellington—Tinkham's Shoe Shop, Jefferson and Harvey Sts., A. Tinkham, Purch. Agt.—power leather stitcher.

Ky., Central City—Illinois Central R.R., F. R. Judd, Engr.—cranes, conveying machinery and other equipment for terminal yards.

Ky., Newport—F. Voss & Sons, 417 West 7th St.—machinery and equipment for lumber and planing mill, to replace that which was destroyed by fire.

Ky., Williamsburg — Rex Harlan Coal Co.—electrically operated coal mining and transmission machinery and equipment.

La., New Orleans — Art Cabinet Shop, 601-607 North Claiborne St., A. Leon, proprietor—4 to 6 in. moulder with bottom roll (used), also bronze, copper and iron wire, assorted sizes, in L. C. L. and car load lots, for the manufacture of screens.

La., New Orleans — Dubus Contg. Eng. Co., Inc., 632 Tchoupitoulas St.—42 x 42 in. x 12 to 16 ft. Cleveland open side planer (new or used).

Me., Portland — Basin Quarries, Inc. (quartz quarries), W. C. Sherbourne, Purch. Agt.—crusher, grinders and conveying machinery for plant at Phippsburg.

Md., Baltimore—J. L. Barr, Consult. Engr., 202 North Calvert St.—9 x 9 in. belt driven ammonia compressor complete with double pipe ammonia condensors, receiver and high pressure trap, either York or Frick (used).

Mass., Boston—Gillette Safety Razor Co., 41 West 1st St.—about $75,000 worth of machinery and equipment for proposed factory.

Mass., Chelsea (Boston, P. O.)—School house Dept., City Hall—manual training machinery, including lathes, planers, saws, saw tables, benches, small tools, etc., for proposed $700,000 high school.

Mass., Westfield—H. B. Smith Co.—complete equipment for new foundry.

Mich., Menominee—Lloyd Mfg. Co., State St.—woodworking machinery for proposed $75,000 factory for the manufacture of baby carriages.

Miss., Hattiesburg—Clyde Lumber Co.—complete lumber mill machinery and equipment, including saws, planers, conveying machinery, etc.

Mo., Columbia — Curators of Missouri University, c/o E. E. Brown, Business Mgr. —receiving bids until June 8 for furnishing and installing traveling cranes, grab bucket and coal bunkers with weighing larry.

Mo., St. Louis—M. Missler, 2925 Sheridan Ave.—power job printing press, either 6 x 8 or 4 x 6.

N. Y., Binghamton—Bd. Educ., D. J. Kelly, Supt. — complete machinery and equipment for proposed vocational school in 7th ward.

N. Y., Brewster—Bd. Educ.—vocational equipment, including lathe, drill, press, saws, conveying and transmission machinery, for $200,000 school.

N. Y., Buffalo—Bd. Educ., 1400 Telephone Bldg., D. J. Sweeney, Deputy Supt.—receiving bids until June 8 for miscellaneous hand tools, iron, steel and sheet metal supplies.

N. Y., Buffalo—Fillmore Ave. Fdry & Iron Wks., 153 Fillmore Ave.—foundry equipment.

N. Y., Buffalo—Hall & Sons, Inc., 69 Tonawanda St.—equipment for molding shop.

N. Y., Buffalo—L. H. Miller, 1868 Seneca St.—bakery equipment.

N. Y., Buffalo—S. Pulka, 167 William St. —bakery equipment.

N. Y., Campbells Point (Sacket Harbor, P. O.)—The New Campbells Point Assn. (summer resort), W. Alexander, Purch. Agt.—one 1½ and one 2½ ton triple chain hoist; one air compressor, 185 lb. pressure with tank, for electric motor drive.

N. Y., Conifer—Emporium Forestry Co., W. L. Sykes, Pres.—one 6 in. heavy duty bandsaw.

N. Y., Falconer—C. A. Reynolds—air compressors, pumps, etc., for proposed gasoline, kerosene and oil distributing station at Westfield.

N. Y., Geneva—Geneva Ice Cream Co., G. A. Wegner, 12 Amherst St., Rochester, Purch. Agt.—two one ton triple geared chain hoists, 150 ft. track with one traveller.

N. Y., Glens Falls—A. W. Perry (lumber) —machinery and equipment for portable sawmill.

N. Y., Marion—Bd. Educ.—vocational equipment for $200,000 school.

N. Y., Newark — Bloomer Bros. Co.—special folding machinery for the manufacture of paper oyster and ice cream containers.

N. Y., Rensselaer Falls—G. H. Simpson Co., Main St. (garage)—4 x 4 in. power operated metal saw, also 180 lb. air compressor with tank, for motor drive.

N. Y., Rochester—Addison Lithographing Co., 59 South Ave.—transmission and conveying machinery and equipment.

N. Y., Rochester—Fearless Dishwasher Co., 179 Colvin St.—machinery and equipment for addition to dishwashing machine factory.

N. Y., Rochester—A. E. Gardner, 74 Reynolds St.—tinshop equipment.

N. Y., Rochester—F. B. Rae Oil Co., Cliff St.—machinery and equipment for proposed $100,000 oil plant, to replace that which was destroyed by fire.

N. Y., Utica—Utica Baking Co., Jay St. —complete mechanical equipment, including mixing machinery for new plant.

N. Y., Utica—Utica Hygeia Ice Corp., C. A. Schmidt, 1124 Pleasant St., Purch. Agt.—artificial ice making machinery and equipment for proposed $75,000 plant.

N. Y., Watertown — Greene's Pastry Shoppe, 228 Goodale St., C. Greene, Purch. Agt.—power operated dough mixing machinery and equipment for electric drive.

N. Y., Webster—Bd. Educ.—vocational equipment for $165,000 school.

N. C., Hendersonville—S. S. Stabler, Box 1231—refrigeration and ice making machinery and equipment.

N. C., Mount Airy—Southern Mantel Co. —wood turning lathe to turn columns up to 6 in. diameter and 7 ft. long.

O., Cleveland—Cleveland Sanitary Wet Wash Co., c/o H. H. Hood, Mgr., 6204 Central Ave.—machinery for proposed $40,000 laundry on Woodhill Rd.

O., Cleveland—Lees-Bradner Co., 6210 Carnegie Ave.—three 5 ton cranes, a.c. motors, belting and shafting.

O., Columbus—Dept. of Welfare, 9th and Oak Sts., J. E. Harper, Dir.—receiving bids until June 16 for cold storage plant and refrigerating equipment for Institution for Feeble Minded at Orient.

O., Columbus—Lindenberg Piano Co., 77 South Gift St., P. Lindenberg, Mgr.—several woodworking machines, including moulding machines.

O., Columbus—Modern Woodworking Co., 476 South High St., W. F. Redd, proprietor —one sander, small sticker, one swing cutoff saw, etc.

O., Dayton—Eng. Division, Air Service, McCook Field—one grab winch for maneuvering airships and one highly mobile winch.

O., Pomeroy—J. M. Crawford Fdry. Co. —foundry equipment.

O., Warren—Bd. Educ.—five 13 in. lathes.

O., Warren—City Baking Co.—bakeshop equipment for new plant.

Okla., Jefferson—E. A. Watt—power finisher for shoe shop.

Pa., Boswell — Bd. Educ. — lathe, press, drill, saw and other vocational equipment.

Pa., Dubois — Reliance Window Glass Mfg. Co.—machinery and equipment for proposed $100,000 glass works, to replace that which was destroyed by fire.

Pa., Erie—Carbo Oxygen Co., Raspberry and 12th Sts.—machinery and equipment for new oxygen plant.

Pa., Erie—Continental Rubber Co., 12th and Liberty Sts.—rubber working machinery and equipment, including molds, etc.

Pa., Franklin—Franklin Steel Wks.—one 20 ton locomotive crane.

Pa., Hazleton—Lehigh Valley Coal Co.—coal mining machinery and equipment for new development near Latimer.

Pa., Jeannette — Jeannette Ice & Cold Storage Co.—equipment for new ice plant.

Pa., Lewis Run — Mars Gasoline Co. — complete gasoline making machinery and equipment.

Pa., Phila.—Arab Gasoline Co., 23rd and Westmoreland Sts.—machinery and equipment for complete gasoline plant at Eastland, Tex.

Pa., Pittsburgh—Bronze Die Casting Co., Union Arcade (foundry)—2 or 3 ton electric crane.

Pa., Pittsburgh—Carnegie Steel Co., Carnegie Bldg., C. N. Miller, Jr., Purch. Agt.—one 30 ton locomotive crane for Mingo Junction, O.

Pa., Pottstown—Glasgow Iron Co.—iron working machinery.

Pa., Reading—Birdsboro Stone Co.—stone crushing machinery and equipment.

Pa., Scranton—Burschel Dairy Co., 822 Hampton St.—bottle cleaning machinery, etc.

Pa., Scranton—New System Radiator Co., 437 Wyoming Ave.—radiator repairing machinery, tools and equipment.

Pa., Tarrs—Bd. Educ.—manual training equipment for new high school.

Tenn., Cedar Springs—Wright & Plye Lumber Co.—sawmill outfit, 25 hp.

Tenn., Sweetwater — Bd. Educ. — vocational equipment for $120,000 school.

Tex., Dallas—Kleber Baking Co., 311-313 North Akard St.—ice making machinery.

Tex., Lubbock—R. Duff—power job press, newspaper press and paper cutter (used preferred).

Tex., Tyler—Byrne Publishing Co.—power job press, Chandler & Price, 14½ x 22 in.

Va., Danville. — Bd. Educ. — vocational equipment, including lathe, press, drill, etc., for $125,000 school.

Va., Richmond—Cussons, May & Co., Inc., 415-19 Bowe St (printers), C. B. Trevett, Purch. Agt.—power paper cutter.

Va., Richmond—Hackley Morrison Co., Inc., 1722 Lewis St. (machinery dealers)—one double cylinder single drum mine hoist, cylinders about 10 x 12 in., drum 36 to 48 in. diameter.

Va., Williamsburg—J. F. Blacknell—soy bean oil mill.

W. Va., Charleston—Independent School Dist.—complete vocational equipment, including lathe, drill, press, saws and transmission machinery.

W. Va., Philippi—Philippi Blanket Mills —textile machinery.

W. Va., Tioga—Cochran Coal Co.—coal mining machinery, including conveying and transmission machinery.

Wis., Fond du Lac—St. Agnes Hospital, 309 East Division St., M. Marcella, Mgr.—ash handling machinery, etc., for proposed $40,000 power plant.

Wis., Madison — Dane County Bd., M. Sommer, Chn., Court House—refrigeration equipment for cold storage plant at county asylum.

Wis., Madison—New York Floral Co., 30 North Carroll St., F. Choles, Mgr.—conveyors, hoist, etc., for proposed greenhouses.

Wis., Manitowoc—Globe Laundry Co., 14th and Washington Sts., L. C. Standt, Purch. Agt.—dryer, five wash trucks and two clothes presses.

Wis., Marshfield—S. Miller Fruit Co.—ice machine, refrigerating machinery, belting and shafting.

Wis., Milwaukee—B. B. Shoe Co., 161 Center St., J. Brindis, Purch. Agt.—shoe working machinery, including vamping machine, eyelet machine, laster, etc.

Wis., Milwaukee — Bldg., Finance & Constr. Co., 786 12th St.—machinery and equipment for proposed $50,000 laundry on National Ave.

Wis., Milwaukee—M. Carpenter Baking Co., 102 7th St.—mechanical baking equipment and conveyors for proposed additions to bakery.

Wis., Milwaukee—W. Gross, 1498 2nd St. (millwork)—one rip saw and one cross-cut saw.

Wis., Milwaukee—B. A. Railton Co., 318 East Water St.—one paper baling machine.

Wis., Milwaukee—D. Rothman, 1037 Grant Blvd. (laundry)—power washers, manglers and drying machine; also belting, shafting and hangers.

Wis., Milwaukee—Turner Heat Treating Co., 126 Ferry St.—several heat treating furnaces.

Wis., Milwaukee—Wisconsin Duplex Percolator Co., c/o C. J. Paikowski, 906 Warren Ave.—plating equipment and furnaces.

Wis., South Milwaukee—Koerner Press, 906 Madison Ave., A. E. Koerner, Purch. Agt.—power paper cutting machine, about 20 in.

Wis., Stoughton—Stoughton High Test Oil Co., H. Christinsen, Mgr.—gasoline tanks and pumps for proposed filling station.

Wis., Tomahawk—Tomahawk Shoe Co., J. W. McHenry, Pres.—machinery, belting and shafting for proposed $50,000 shoe factory.

Wis., Wauwatosa—Forsyth Leather Co., State St., Cahill & Douglas, Engrs., 217 West Water St., Milwaukee, Purch. Agts.—steam jet ash conveyor for proposed power plant.

Wis., Wisconsin Rapids—McKinnon Mfg. Co., 717 Grand Ave. (manufacturer of automobile bodies), H. McKinnon, Purch. Agt. —small cross cut bandsaw.

Ont., Collingwood—R. Dodds, c/o Dodds Iron Wks.—special machinery and equipment for flour mill on Birch St.

Ont., Goderich—Western Canada Flour Mills, J. W. Fraser, Mgr.—equipment including special salt handling equipment, to double present output of salt plant

Ont., Hamilton—Dominion Canners Ltd., Hughson St.—equipment for branch plant, to replace that which was destroyed by fire at Leamington.

Ont., Kirkland Lake—Wright Hargreaves Mines, Ltd.—machinery to increase capacity of gold mining mill from 70 to 400 or 500 ton per day, including crushers, stamp mills, tube and ball mills, etc., for electric power.

Ont., London—Hunt Bros., Ltd., c/o C. R. Hunt, Nightingale Ave.—grain handling and unloading equipment for proposed $1,500,000 elevator at Sarnia.

Ont., New Hamberg—C. I. Zehr—circular saw outfit with edger, for small steam sawmill, to replace that which was destroyed by fire.

Ont., Oakville — Dominion Wire Bound Box Co., Ltd.—box making and other machinery to replace fire loss.

Ont., Oakville—Oakville Basket Co., Ltd., J. Moffat, Purch. Agt.—machinery.

Ont., Renfrew—Renfrew Flour Mills Co., Ltd., T. A. Low, Pres.—flour mill machinery.

Ont., Windsor — Haugh Lumber Co., Windsor Ave.—lumber mill machinery and equipment, including saws, planers, conveying machinery, etc.

Que., Cap de Madeleine (Three Rivers, P. O.)—Riverside Mfg. Co., Ltd. (sawmill)—log saw, drag saw and traveling carriage saw.

Que., Drummondville—MacDonald Wire Goods Co., Ltd. (stamped and hardware specialties), J. P. MacDonald, Secy.—two automatic wire forming machines and one small size nickel plating plant.

Que., Montreal—Canadian Sawdust Co., Ltd., 1400 Chapleau St., G. C. Goodfellow, Purch. Agt.—complete equipment for sash and door factory to replace fire loss.

Que., Montreal—J. I. Legace, 349 William St. (carriage maker)—woodworking machinery to replace fire loss.

Que., Montreal East—Natl. Cement Co., Ltd., I. 'La Plante, 168 Plymouth Ave., Fall River, Mass., Pres.—cement making machinery, equipment for hammer mill, burners and pulverizers, capacity 4,000 bbl. per day.

U. T., Pearl Harbor—Bureau Yards & Docks, Navy Dept., Washington., D. C.—receiving bids until June 25 (change of date), for refrigerating equipment, including motor driven compressor, condenser, liquid receiver, brine cooler, motor driven brine pump, oil and scale traps, piping, etc. Alternate bids on self-contained hermetically sealed refrigerating machine or on direct expansion system. L. E. Gregory, Ch. of Bureau. Specification 4767.

Metal Working Shops

Ala., East Thomas (Birmingnam, P. O.)—The St. Louis-San Francisco Ry., 900 Olive St., St. Louis, Mo., awarded the contract for the construction of a 20 stall roundhouse, car repair shop, power house, mill shop, store room, etc., here. Estimated cost $500,000. Noted Mar. 15.

Calif., Corte Madera—The Commercial Center Realty Co., 916 Kearny St., San Francisco, is having plans prepared for the development of a townsite, including construction of a garage, etc., between here and Larkspur. Cost will exceed $500,000. M. J. Lyon, 916 Kearny St., San Francisco, Archt.

Calif., Hueneme—The Siebel Air Spring Co., c/o C. Pilgrim, plans to build a factory for the manufacture of automobile springs. Cost will exceed $50,000.

Calif., Los Angeles—The J. W. Robinson Co., 600 West 7th St. (dry goods), has had plans prepared for the construction of a 1 story, 105 x 158 ft. garage on 8th and Whittier Sts. Estimated cost $40,000. Norton & Wallis, Pacific Finance Bldg., Los Angeles, Archts.

Calif., Los Angeles—Walker & Eisen, Archts., Pacific Finance Bldg., are receiving bids for the construction of a 4 story (ultimately 8 story) garage and stores building on Kenmore and 6th Sts. for J. B. Lilly, et al., c/o Architect.

Calif., Merced—L. R. Lurie, 315 Montgomery St., San Francisco, is having plans prepared for the construction of a 1-story automobile sales and service station, here. Estimated cost $50,000. O'Brien Bros., 315 Montgomery St., San Francisco, Archts. Fleutsch & Lewis Motor Co., Merced, lessee.

Calif., Oakland—The Victor Talking Machine Co., c/o W. Knowles, Archt., Hearst Bldg., San Francisco, is having plans prepared for the construction of a factory on 73rd Ave., here. Estimated cost $250,000.

Calif., Sacramento—The Engineering Department of the Western Pacific R.R. Co., Mills Bldg., San Francisco, is receiving bids for the construction of 1 story additions to its Jeffery shops, here. Cost will exceed $50,000. J. W. Williams, Ch. Engr.

Calif., San Bernardino—The Atchison, Topeka & Santa Fe Ry. Co., Kerckhoff Bldg., Los Angeles, is having plans prepared for the construction of machine shop, tin and pipe shops, here. Cost will exceed $500,000. R. B. Ball, Ch. Engr.

Calif., San Francisco—J. Allec, 2140 Folsom St., is having plans prepared for the construction of a 1 story, 200 x 213 ft. shop and factory on Folsom and 17th Sts. Estimated cost $80,000. A. S. Bugbee, 26 Montgomery St., San Francisco, Archt. E. R. Bacon Co., 51 Minna St., San Francisco, dealers in contractors' equipment, repair of concrete mixers, etc., lessee.

Calif., San Francisco—The Amer. Can Co., Mills Bldg., awarded the contract for the construction of a 2 story addition to its can factory on 3rd and 21st Sts. Estimated cost $300,000.

Calif., San Francisco—The Pelton Water Wheel Co., 19th and Harrison Sts., plans to build a 150 x 200 ft. factory. Estimated cost $300,000. Engineeer or architect not announced.

Calif., San Francisco—The West Coast Laundry Mchy. Co., 3246 17th St., is having plans prepared for the construction of a 2 story factory and shop on Capp and 17th Sts. Cost will exceed $10,000. P. Righetti, 12 Geary St., San Francisco, Archt.

Calif., Vernon (Watts, P. O.)—The Hoyt Heater Co., 2850 East 2nd St., Los Angeles, is having plans prepared for the construction of a 2 story, 100 x 125 ft. factory for the manufacture of water heaters, here. Estimated cost $75,000. Walker & Eisen, 325 Pacific Finance Bldg., Los Angeles, Archts.

Fla., Orlando—I. W. Phillips & Sons awarded the contract for the construction of a 1 story garage on Orange and Jackson Sts. Estimated cost $90,000.

Ill., Chicago — M. Espert, 236 North Clark St., awarded the contract for the construction of a 6 story, 100 x 123 ft. garage and service station on Dearborn and 26th St. Estimated cost $300,000.

Mich., Menominee—The Lloyd Mfg. Co., State St., is receiving bids for the construction of a 3 story, 72 x 400 ft. factory for the manufacture of baby carriages. Estimated cost $75,000. Hubert & Nelson, Menominee, Archts.

Mo., St. Louis—The Great Western Smelting & Refining Co., 3100 North Bway., is receiving informal sub-bids for the construction of a 1 and 2 story, 100 x 400 ft. steel plant on Bway. Estimated cost $150,000. Work will be done by separate contracts under the supervision of J. M. Hirshstein, Archt., 5777 DeGiverville Ave., St. Louis.

Mo., St. Louis—The St. Louis-San Francisco Ry., 900 Olive St., will soon award the contract for the construction of a 20 stall roundhouse, car repair shop, machine shop, power plant, mill shop, two wash and locker rooms, etc., on Fyler Ave. and Frisco right-of-way. Lindenwood. Estimated cost $500,000. J. G. Jonah, Ch. Engr. R. C. Stephens, Frisco Bldg., St. Louis, Archt. Noted Mar. 15.

N. Y., Albany—The Albany Garage Co., 28 Howard St., plans to build an addition to its garage on Beaver St. Cost will exceed $50,000. C. D. Hakes, Pres.

N. D., Minot—K. Kulaas will soon award the contract for the construction of a 2 story, 80 x 150 ft. garage. Estimated cost $45,000. I. L. Rush, Minot, Archt. Noted Apr. 26.

O., Cleveland—The Blazer Realty Co., 3402 Altoona Ave., awarded the contract for the construction of a 1 story, 40 x 126 ft. garage. Estimated cost $40,000.

O., Cleveland—M. S. Koblitz, 422 Leader-News Bldg., is having plans prepared for the construction of a 6 story automobile sales and service station on a 60 x 190 ft. site at 1905 Prospect Ave. Estimated cost $20,000. P. Matzinger Co., Caxton Bldg., Cleveland, Archts.

O., Cleveland—J. Miller, 2701 East 55th St. (trucking), is receiving bids and will open same about June 10 for the construction of a 1 story, 85 x 140 ft. garage on East 55th St. and Bragg Rd. Estimated cost $40,000. Private plans.

O., Cleveland—The Schonberg Printing Co., 102 St. Clair Ave., N. W., awarded the contract for the construction of a 1 story, 50 x 129 ft. and 20 x 25 ft. factory, boiler house and garage on East 25th St. and Payne Ave. Estimated cost $50,000. D. Schonberg, Pres.

O., Columbus—The Columbus White Motor Truck Co., Central Natl. Bank Bldg., is having plans prepared for the construction of a 1 story, 100 x 115 ft. automobile sales and service station on West Broad St. Estimated cost $45,000. C. J. Bassett, Mgr. Private plans.

Okla., Tulsa—The Oklahoma Steel Castings Co., 411 Central Natl. Bank Bldg., is having plans prepared for the construction of a 2 story addition to its plant. Estimated cost $50,000. Private plans.

Pa., Allentown—The International Motor Co. plans to build a 1 story, 50 x 700 ft. machine shop on 10th and Harrison Sts. Estimated cost $50,000. Engineer or architect not announced.

Pa., Brownsville — The Ehrenpries Tire Sales Co. awarded the contract for the construction of a 2 story, 37 x 90 ft. garage. Estimated cost $40,000.

Pa., Pittsburgh—The Standard Sanitary Mfg. Co., Bessemer Bldg., manufacturer of plumbers' supplies, awarded the contract for the construction of a 1 story, 38 x 148 ft. furnace building at 527 Preble Ave.

R. I., Providence — The What Cheer Stables Co., Benefit and Meeting Sts., awarded the contract for the construction of a 2 story addition to its garage and service station. Estimated cost $75,000. Noted May 24.

Wash., Seattle—Frederick & Nelson, 5th and Pine Sts., plan to build a 120 x 120 ft. warehouse and garage in the Westlake Ave. Dist.

Wis., Berlin—The Schaefer Mfg. Co., is having plans prepared for the construction of a 1 story, 60 x 120 ft. machine and service shop. Estimated cost $40,000. F. D. Chapman, Genl. Mgr. Private plans.

Wis., Burlington—Patefield Bros. Co. will build a 2 story, 50 x 70 ft. garage and repair shop.

Wis., Kiel—The Kiel Machine Co. awarded the contract for the construction of a 1 story, 62 x 84 ft. machine shop. Estimated cost $40,000. Noted May 24.

Wis., Madison—The Chicago & Northwestern Ry., East Madison, is having plans prepared for the construction of a 1 story, 60 x 200 ft. power house and machine shop, here. Estimated cost $150,000. A. W. Bowers, 201 South Blair St., Madison, Divisional Agent. Private plans.

Wis., Mayville—The Feilbach Mfg. Co. plans to build a 2 story, 60 x 90 ft. factory for the manufacture of automobile accessories, shock absorbers, etc. W. O. Feilbach, Mgr. Engineer or architect not selected.

Wis., Racine—The Belle City Malleable Iron Co., Kewaunee St., awarded the contract for the construction of a 1 story, 145 x 230 ft. core and mill building on Forest St. Estimated cost $125,000. C. S. Anderson, Mgr.

B. C., Vancouver—The Canadian Pacific Ry. Co., Canadian Pacific Ry. Depot, awarded the contract for the construction of 1 story, 90 x 240 ft. car repair shops at the foot of Drake St. Estimated cost $80,000. Noted May 3.

Que., Montreal—The Central Garage, 249 Laval Ave., is having plans prepared for the construction of a garage. Estimated cost $60,000. Gascon & Parent, 502 St. Catherine St., E., Montreal, Archts.

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